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Table of Contents

INTRODUCTION

The U.S. Army Research, Development and Engineering Command (RDECOM) became an official U.S. Army Materiel Command (AMC) major subordinate command on March 1, 2004.

Established as a provisional command in October 2002, RDECOM was conceived to provide a single AMC command consisting of interdependent materiel research and development organizations with an improved focus on integrated and innovative science, technology, engineering, and analysis programs for the Soldier.

RDECOM, headquartered at Aberdeen Proving Ground, Md., promotes and facilitates coordination and agility to stay ahead of ever-changing technological advances.

RDECOM has expanded working relationships with other Army elements, industry, academia, other military services, other government agencies and international partners, by focusing on improving coordination and integration of cutting edge technological research, development and engineering in response to Warfighter requirements.

RDECOM manages seven research, development and engineering centers, plus the U.S. Army Research Laboratory, the U.S. Army Materiel Systems Analysis Activity, international technology centers, and several technology-focused integrated process teams. RDECOM has more than 17,000 military, civilian and direct contractor personnel, a multi-billion dollar annual budget and is responsible for 75 percent of the Army's science and technology objectives. RDECOM ensures the Army has the technology it needs for the 21st century and beyond.

The U.S. Army Research, Development and Engineering Command mission is to get the right technology to the right place, at the right time, for the Warfighter.

PURPOSE

This book was designed to educate a broad audience about the organic capabilities that reside within RDECOM. The Research, Development and Engineering Centers (RDECs), Army Research Laboratory and the Army Materiel Systems Analysis Activity are highlighted, providing the reader a snapshot of RDECOM's capabilities, facilities' mission, partnerships and contact information. This book is designed to be a RDECOM-focused supplement to the AMC "Metal Book" published by the AMC Director of Industrial Base Capabilities, (703) 806-9312.

RDECOM facilities may partner with the private sector and other parts of the public sector under multiple legal authorities. For more information on Public-Private Partnerships, please contact Partnerships@hqamc.army.mil.

RDECOM

Aviation and Missile Research, Development and Engineering Center (AMRDEC)

Aviation and Missile Research, Development and Engineering Center (AMRDEC)

Redstone Arsenal, AL 35898-5000

Mission

The Aviation and Missile Research, Development, and Engineering Center (AMRDEC) conducts research and exploratory and advanced development; it also provides one-stop life cycle engineering support for aviation and missile weapons systems and unmanned aerial and ground vehicle platforms to the warfighter.

History

The genesis of the Aviation and Missile Research, Development, and Engineering Center (AMRDEC) can be traced to October 1948 when the Chief of Ordnance designated Redstone Arsenal as the center for research and development in the field of rockets. About a year later, on October 28, 1949, the Secretary of the Army approved the transfer of the Ordnance Research and Development Division Sub-Office (Rocket) at Fort Bliss, Texas to Redstone Arsenal. Among those transferred were Dr. Wernher von Braun and his team of German scientists and technicians who had come to the United States after World War II. The Von Braun Team is most noted for its pioneering efforts in helping the Army at Redstone lay the foundation for U.S. space exploration.

With the transfer of the Von Braun Team to the National Aeronautics and Space Administration (NASA) in July 1960, research and development activities by the Army at Redstone turned to integrating space-age technology into weapons for the Soldier in the field. When the U.S. Army Missile Command (MICOM) was activated on August 1, 1962, the Directorate of Research and Development was established as one of its primary organizational elements. The title of this directorate was redesignated the Research and Development Directorate effective July 23, 1965. The Research and Development Directorate was redesignated the Research and Engineering (R&E) Directorate (Provisional) on December 23, 1968 to standardize its terminology with that of other AMC commands. This provisional status was removed effective June 30, 1969.

The R&E Directorate was redesignated the Directorate for Research, Development, Engineering and Missile Systems Laboratory (RDE&MSL) effective January 4, 1971. This laboratory, in turn, was redesignated the Army Missile Research, Development and Engineering Laboratory (MRDEL) effective October 1, 1972. With the establishment of the U.S. Army Missile Research and Development Command (MIRADCOM) on January 31, 1977, the Technology Laboratory and the Engineering Laboratory were born. The Technology Laboratory was reorganized/redesignated as the Army Missile Laboratory (AML) effective October 7, 1979 as part of the shift from the dual to the merged command structure of the reinstituted MICOM. Also effective this date, the Engineering Laboratory was realigned and established as the Engineering Directorate. This directorate was abolished as a separate command element on September 28, 1980, and its functions were placed under AML.

In May 1985, AML was redesignated the Research, Development and Engineering Center (RDEC) in compliance with AMC directions to establish research, development and engineering (RD&E) centers to serve as technical centers of excellence and to assure maximum return from resources devoted to RD&E efforts. The establishment of the U.S. Army Aviation and Missile Command (AMCOM) on July 17, 1997 created the need for two RDECs under the auspices of this command: the Aviation RDEC (AVRDEC) and the Missile RDEC (MRDEC).

October 1, 1999 marked the first official day of the provisional AMRDEC. Dr. William McCorkle was named Director of this new provisional organization which was formed by merging the AVRDEC and the MRDEC. The effective date of the permanent merger was October 1, 2000.

Installation Overview

AMRDEC's annual budget is approximately $1.5 billion. The Center Headquarters, as well as 10 of its 12 Directorates, is located on the 38,000-acre Redstone Arsenal in the Northeast Alabama City of Huntsville. Personnel are also located at Fort Eustis, VA; NASA Ames at Moffett Field near San Jose, CA; Corpus Christi, TX; and NASA Langley in Hampton, VA. More than 5,400 men and women (military, government civilian, and contractor personnel) are dedicated to meeting the current and future needs of America's warfighters and allies.

AMRDEC's distinction is built on a reputation for providing synergistic expertise to its customers. Numerous Department of Defense and other Federal agencies, as well as academia, corporate, and industrial researchers and developers, seek the Center's science and technology expertise, which is characterized by its vast resources of talented and technically proficient personnel and unique test bed capabilities. The Center's Core Competencies include:

- Developing technologies which create overwhelming lethality and decisive survivability on the battlefield
- Performing system engineering and integration and rapidly transition technologies to the Soldier
- Providing high quality technical support to weapons systems throughout the life cycle

AMRDEC's 2,700 employees develop technologies and provide engineering services.

Contact Information

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Redstone Arsenal, AL 35898-5000
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amrdec-pao@amrdec.army.mil

Major Equipment/Facilities

Advanced Simulation Center

The Advanced Simulation Center consists of 10 individual facilities which provide missile and submunition hardware-in-the-loop simulation capabilities. The following types of guidance signals are included in the range of capabilities: microwave radar, millimeter wave radar, imaging and non-imaging infrared, visible, laser, combinations of radar and infrared signals, and inertial motion. Target signatures and background scenarios are radiated from special-purpose signal generators and received and processed by the missile sensors to give real-guidance signals for use in trajectory simulations. (System Simulation and Development Directorate)

Advanced Prototyping Engineering & Experimentation (APEX) Laboratories I & II

These interconnected simulation facilities provide unique collaboration of force-on-force, soldier-in-the loop, hardware-in-the-loop, and engineering-level simulations. The APEX Labs provide two wrap-around, out-the-window displays for immersive Soldier-in-the-loop interaction with evolving aviation and missile system designs. The labs link virtual, live, and constructive models with geographically distributed participants. Doctrine, tactics, mobility, logistic support, C3, and human reaction are modeled in a synthetic battlefield to allow rapid turnaround, realistic testing and analysis. (System Simulation and Development Directorate)

Advanced Prototyping Engineering & Experimentation (APEX) Laboratory III

The APEX III Lab provides the central node at the AMRDEC for distributed simulations (DS). This facility contains 10 interconnected application rooms, permits connection of multiple local area networks, and supports hardware/software essential in conducting DS exercises in both Distributed Interactive Simulation (DIS) and High Level Architecture (HLA). It houses the Defense Research Engineering Network (DREN) gateway, which facilitates simultaneous distributed experiments between RDEC labs, Tank Automotive Research, Development and Engineering Center (TRADOC) Battle Labs, industry participants, and academia. During FY03, System Simulation and Development Directorate made significant investments in APEX III to accommodate classified local and distributed simulation events, including FASTLANE encryption for wide-area simulation activities. (System Simulation and Development Directorate)

Javelin Simulation Center

The Javelin Simulation Center possesses a world-class digital simulation capability for design, analysis and evaluation of the Javelin weapon system. This includes the Javelin Integrated Flight Simulation (IFS) which integrates a six-degrees-of-freedom simulation with tactical missile code and high fidelity modeling of real-world environments. The IFS executes the closed-loop simulation by using missile tactical processors. The lab is the focal point of the Javelin Integrated Test and Simulation Network that links three other technology areas within AMRDEC, the Redstone Technical Test center and the prime contractor. (System Simulation and Development Directorate)

Virtual Targets Center (VTC)

The VTC is a joint effort with PEO STRI, PM ITTS TMO to provide signature management and predictive signature design services. It is organized into three areas: 1) The Virtual Targets Program, which creates digital geometry target models. 2) The Target Generation Lab, which generates multiple types of simulation target models ranging in complexity from low-resolution stealth views such as used by OneSAF to high-resolution, Hardware-In-the-Loop and predictive signature codes. 3) The Army Model Exchange, which provides a protected website for the immediate download of thousands of target models. (Systems Simulation and Development Directorate)

Aerial Targets Laboratory

The Aerial Targets Laboratory provides the capability to integrate and evaluate components and technologies on existing towed targets. It provides a facility to design, develop and assess performance of new target configurations. Information collected in this facility allows for the development and maintenance of detailed mathematical representations of flight dynamics of targets for use in high-fidelity simulation. Development and maintenance of system-level training hardware and software for fielded target systems is also performed in this unique facility. (System Simulation and Development Directorate)

Small Unmanned Aerial Vehicle Laboratory (SUAVL)

The Small Unmanned Aerial Vehicle Laboratory (SUAVL) is used in research and development of new technologies applicable to small UAV systems, in component integration and subsystem insertion, in evaluating existing airframes, components and subsystems and developing new evaluation and prediction methodologies for small unmanned aerial systems. The facility also serves as the primary repository of small UAV performance and is the basis for future work in small UAV technologies between RDEC labs, TRADOC Battle Labs, industry and academia. (System Simulation and Development Directorate)

Aero-Optic Evaluation Center (AOEC), Large Energy National Shock (LENS) Tunnels I & II

The AOEC facility provides world class capability for aero-thermo-chemical, aero-optics and aero-propulsion testing in the Mach number range from 2.5 to 15 using the world's most powerful shock tunnels. The value of the AOEC facility stems from its capability to duplicate flight conditions experienced by supersonic and hypersonic vehicles. LENS tunnels can simulate atmospheric conditions between sea level and 70 km. This ability provides the community an alternative to full-scale flight testing at a fraction of the cost with improved variety and quality of data. (System Simulation Development Directorate)

Larry O. Daniel Prototype Integration Facility (PIF)

The PIF consists of a facility that houses both engineering and manufacturing functions. There is a high bay that contains two 20-ton bridge-style cranes used for ground and airframe platform integration. The low bay area houses machinery and tooling used to produce most mechanical and electrical components at the subsystem level. All engineering and technical data development is contained within the office area of the PIF. Adjacent to the PIF are facilities specializing in printed circuit board plating and another for finishing/painting processes. The PIF also has access to facilities including three contractor provided facilities. (Engineering Directorate)

Automatic Test Equipment/Test Program Set (ATE/TPS) Laboratory

The ATE/TPS Laboratory consists of an integration lab that houses both engineering development and sustainment functions with tactical and non-tactical Army standard ATE, Integrated Family of Test Equipment (IFTE). The lab has four electronic and one electro-optic tester. The laboratory is also a Huntron Gold Disk certified development center. The lab also has the ability to develop and execute test and diagnostics for circuit cards with the VTS-1000. Digital automatic test vector generation is available through Teradyne LASAR software and hardware modelers. (Engineering Directorate)

Automatic Test Equipment/Test Program Set (ATE/TPS) Sustainment Support Center (SSC)

The ATE/TPS SSC consists of facilities that house subject matter experts for staging and fielding of Automatic Test Equipment and Test Program Sets. The SSC uses Commercial Equivalent Equipment (CEE) and Base Shop Test Facilities (BSTFs) to provide sustainment functions on AMCOM managed weapon system Test Program Sets (TPS) and Army standard ATE. The SSC currently supports 75 tactical and 13 non-tactical customers with a total of 125 ATEs. The ATE/TPS SSC is performing RESET at 14 of the Army's 22 tactical Electronic Equipment Test Facilities (EETF). The SSC is authorized as an ATE/TPS minor repair activity. The SSC supports current operations in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). (Engineering Directorate/IMMC)

Diagnostic/Prognostic Laboratory (DPL)

The DPL Laboratory focuses on advances in micro-electro mechanical systems (MEMS), nanotechnology and smart materials to enable sensing technologies (conventional, fiber-optics, piezoelectric) and actuation technologies (electro-rheological fluids, shape-memory alloys, piezoelectric materials) that initiate embedded diagnostics and Condition Based Maintenance (CBM) implementation. The DPL examines advances in electro/optical/mechanical development of miniaturized sensor networks to provide both dynamic and non-intrusive interferometric measurements for embedded analysis. Additional assessment areas include embedded ultra-wideband and/or laser scanning, opto/electronic spectral sensors for in-line fluid analysis, remote diagnostic/prognostic data collection and processing, wireless sensor technology, self-diagnosing electrical and mechanical systems, and diagnostic data bus throughput/concentration. (Engineering Directorate)

Wireless Diagnostics Laboratory (WDL)

The WDL focuses on the application of advanced wireless communications technologies to enable embedded diagnostics and Condition Based Maintenance (CBM) implementation. The WDL is constantly seeking technology that would provide the ability to remotely access sensor data from aviation platforms, missile systems and tactical ground vehicles in order to diagnose health status via a wireless connection utilizing ruggedized laptop computer interrogators. This remote access would provide an extension of the existing on-board diagnostic systems, collecting and analyzing data from sensors located throughout the weapon system. The widespread use of digital diagnostic and prognostic electronics incorporated into commercial and military vehicle systems, along with the commercial availability of wireless electronics, has provided an opportunity to shift current and future Army tactical weapon systems maintenance operations from routine/unscheduled maintenance and repairs to preventive maintenance. An urgent need exists to monitor the health of digitally equipped tactical wheeled vehicles currently operated in Operation Iraqi Freedom (OIF) and other areas currently engaged in war. The WDL successfully applied cutting edge wireless technology to monitor existing tactical vehicle onboard sensors/diagnostics systems and to enable preventive maintenance efficiency and avoid catastrophic failures. The WDL developed a wireless, embedded diagnostic system capable of automatically detecting and reporting vehicle system and subsystem out of tolerance conditions. The information captured can be used to prescribe any required prescriptive or preventive maintenance actions and to automatically capture and record data necessary for failure trend analysis. (Engineering Directorate)

Redstone Aviation Propulsion Test and Research (RAPTR) Facility

The Redstone Aviation Propulsion Test and Research(RAPTR) Facility is an advanced, ground-level turboshaft engine test facility with capability for test and evaluation of aircraft turboshaft engines and components. Employing extensive and accurate instrumentation into a scalable, highly flexible data acquisition and control system, RAPTR is able to perform single, manually-controlled engine operations as well as complex and repeated test sequences in closed loop. MIL-STD-1553 architecture is incorporated into RAPTR. RAPTR incorporates facility safety controls that protect personnel as well as test assets. (Aviation Engineering Directorate)

AED-A's Flight Control Technology Laboratory

AED has established an effective helicopter flight control technology development lab targeted at greatly improving the operational capability of existing Army aircraft. The lab is used to develop and evaluate flight control laws for partial authority or fly-by-wire control systems. Integrated handling qualities and flight control system design tools developed by AFDD are used to optimize control law gains and time constants against applicable aircraft handling qualities specifications. In addition, manned simulation is used in the lab to assess different control concepts and to evaluate transitions between control law modes. (Aviation Engineering Directorate)

AATD's Countermeasure Test Facility

The turboshaft engine test stand is capable of operating at full power in a simulated aircraft environment to measure acoustic and/or IR radiation and signature. Instrumentation is capable of 96 pressure channels and 105 temperature channels. Mobile Aircraft Infrared Measurement System (AIMS) is field deployable and is used to take full-spectrum IR measurements at our CTF Facility and remote locations.

AATD's Structural Test Facility

The Structural Test Facility provides a wide variety of testing equipment, fixtures and facilities to perform both unique aviation component testing as well as common types of materials testing capabilities. The facility includes a rotor blade mid-span fatigue test fixture, rotor blade root-end test fixture, torsional fatigue test machine, Instron and 300 kip Tinus-Olsen load frame, and a structural backstop which can accommodate a UH-60 size helicopter.

AATD's Small Unmanned Aerial Vehicle Facility

Research and development of manned/unmanned system technology is supported in this facility which contains sufficient space to assemble and maintain multiple UAVs. The facility is located on Felker Army Airfield (FAAF) and agreements are in place with both the FAA and FAAF to allow UAV operations in the local airspace. AATD regularly operates both fixed and rotary wing UAVs at this facility in support of it's R&D initiatives and can support customer projects as well.

AATD's Experimental Fabrication Facility

The Experimental Fabrication Facility provides aviation fabrication support to special operations aircraft residing at Fort Eustis , VA and other bases in the United States. Support is also provided to AATD for in-house testing and prototype fabrication of Army aviation initiatives. The capability exists to produce almost any machined part that would be found in use on a current Army aircraft. The machinist routinely produced parts with tolerances of less that one-thousandth of an inch in any configuration.

AATD's Instrumentation Facility

The Instrumentation Facility provides instrumentation support for flight tests of prototype weapons systems using a vast array of airborne sensors, transducers, signal conditioning and encoding devices, solid-state recorders, telemetry transmitters, telemetry receivers, and decoders. A mobile instrumentation van is maintained to collect, process, and analyze real-time data at test locations both on-site at Fort Eustis or at live-fire test ranges.

AATD's Aviation Flight Support Facility

This facility consists of two adjacent helicopter pads located at Felker Army Airfield on Fort Eustis. A staff of government and contractor personnel provide aircraft maintenance and training for the Army's AH-64, AH-1, UH-60A/L, OH-58D, UH-1 helicopters as well as the C-12 fixed-wing aircraft. The Flight Projects Office provides test planning, airworthiness support and test pilots for experimental flight test projects.

AATD's Vehicle Antenna Measurement Facility (VAMF)

The VAMF is used to conduct radio-frequency (RF) characterization of communication, navigation and ASE/ECM antennas and sensors test aircraft. The facility is capable of automated antenna gain pattern measurement and has an adjustable vehicle rotation system, capable of 360 degree azimuthal rotation to conduct RF pattern measurement of antennas and sensors
located on vehicles up to 40,000 pounds gross weight and 36-foot wheel base.

Ballistic Test Facility (AATD)

This facility includes two outdoor ballistic test ranges and one indoor test range. These ranges have instrumented data acquisition and analysis capability. An EPA approved fuel recovery system is incorporated in one of the outdoor ranges for use in testing aircraft fuel tanks. The facility is capable of test specimens up to full-scale aircraft against API and HEI threats up to 30mm in both foreign and domestic ammunition.

Ducted Rocket Test Facility

This is the most modern, economical, sub-scale direct connect air facility in the world and is used for testing ducted rockets and ramjets. Completed in 1995, it utilizes state-of-the-art computer control to deliver a wide range of airflow rates and temperatures during a single test run, in effect 'flying' a mission while on the test stand. (Propulsion and Structures Directorate)

Propellant Aging and Mechanical Properties Facility

State-of-the-Art laboratory and remote aging facilities, unique to the Army, dedicated to characterization and sensitivity testing of energetic materials used in rocket motors, warheads, and related ordnance devices. Engineering analysis tools and test equipment to assess solid rocket motor structural integrity and service life extension and to perform analytical chemistry evaluations, forensic investigations on failed hardware or foreign systems exploitation. Completed in 1988, it meets DoD's rigorous safety requirements for attended operations, storage, and handling of hazardous propulsion materials. (Propulsion and Structures Directorate)

Two-Room Blast Characterization Facility

The AMRDEC has constructed and is currently doing evaluation of explosives in a two-room, non-responding structure outside of TA-10. In this facility, novel explosive charges of up to 15 pounds are evaluated for blast overpressure and thermal output within a confined space. The structure, based on a Marine Corp ORD for fire from enclosure (FFE), is one of only two facilities of its kind in the world. The dimension of each room is 12x15x7 feet. The primary blast room is layered with replaceable mild steel. Both rooms are instrumented with an adaptable array of transducers, thermocouples, and calorimeters. The primary room is also fitted with a barrel feature for mechanically measuring total impulse. (Propulsion and Structures Directorate)

Gel Propellant Rheology Facility

This facility is used to determine rheological properties of gelled propellants over the full range of the Army operational temperature limits and for shear rates equivalent to those imposed on the gels by engine injectors. This information is required to minimize the volume and weight of gel propulsion systems. (Propulsion and Structures Directorate)

Signature Characterization Facility (SCF)

This facility is used to characterize the exhaust plumes of rocket motors. The facility consists of a static test stand mounted inside an environmental chamber. Small test motors can be fired under any atmospheric condition of temperature and humidity, and evaluated as to their exhaust characteristics. These include visible and infrared flash, visible and infrared smoke attenuation, toxicity, particle analysis, and mm wave radar absorption. (Propulsion and Structures Directorate)

Composites Manufacturing Facility

Wholly Government owned and operated, the Composites Manufacturing Facility provides MRDEC engineers with a "hands-on" capability in missile composites manufacturing from project concept, through fabrication, and testing. This facility is the Government's principal repository of technical expertise in this area. (Propulsion and Structures Directorate)

Materials Facility

The materials facility is equipped with state-of-the-art equipment for materials testing and analysis. The facility contains equipment for mechanical testing, metallography, failure analysis, analytical chemistry, heat treating, corrosion testing, and materials processing. (Propulsion and Structures Directorate)

Modal Analysis and Visualization Equipment

This state-of-the-art equipment is used to measure and visualize the vibration characteristics of military hardware. It features a very large and powerful multi-channel data acquisition capability for determining structural mode shapes and natural frequencies. Obtained in 2002, the equipment supports field failure investigations and development of new military systems. (Propulsion and Structures Directorate)

Rocketball Test Facility

This test facility offers the capability to emulate and measure guided missile radar cross-section without requiring flight tests of tactical missiles. This facility was developed in support of vehicle protection systems development efforts. (Propulsion and Structures Directorate)

Microfabrication Laboratory

The laboratory includes a specialized clean room space up to class 100, plus a clean room space housing associated equipment. This area is divided into three separate laboratory areas: mask making and photolithography, mask aligners and spinners for layering of EO polymer materials, and micromachining (DRIE, RIE, and Ion milling) and thin-film metals and dielectric materials deposition. Also housed in this complex are precision surface analysis instruments (mechanical and optical surface profilers), a scanning electron microscope, and a flip-chip bonder. (Weapon Sciences Directorate)

Anechoic RF Test Chamber

This facility is world renowned for its wide anechoic bandwidth and physical size. A specially designed floor provides realistic simulation of surface wave propagation - a unique capability. The chamber is 114 x 25 x 40 feet, with a 16 x 18 feet door. It has supported tests of armored vehicles, small helicopters, battlefield radars, and tactical missiles and launch vehicles. (Weapon Sciences Directorate)

Platform Integration Laboratory

This laboratory provides the capability of the AMRDEC to perform hardware modifications and platform integration activities to ground and air weapon systems. This laboratory also develops the AMRDEC LAV test-beds, which demonstrate emerging missile, launcher and fire control technologies in a relative environment. (Propulsion and Structures Directorate)

NASA Vertical Motion Simulator

This facility consists of four interchangeable cabs and computer image generator visuals on top of the worlds largest amplitude 6 DOF motion base, used to conduct 8-10 simulations a year, including JSF, Comanche, UH-60, Shuttle, and shipboard ops. (AFDD)

Rotorcraft Advanced System Concepts Airborne Lab (RASCAL) JUH-60A (AFDD)

RASCAL is a full authority, fly-by-wire, glass cockpit in-flight simulator used for a wide range of flight control and advanced guidance display work by both the AMRDEC and NASA. It is the only helicopter in-flight simulator in the U.S. (AFDD)

National Full-Scale Aerodynamics Complex (NFAC)

This facility is the world's largest wind tunnel consisting to two separate test sections (40'x80' and 80'x120') capable of accommodating aerodynamic testing of articles up to full-scale, at speeds of up to 250 kts. Although a NASA facility, it is to be operated by the USAF beginning in FY06 with the Army as the principal customer. (AFDD)

US Army AMCOM AMRDEC Life Cycle Software Engineering Center Complex

Life Cycle Software Engineering Center (LCSEC) Complex - A Level 4 Capability Maturity Model Organization comprised of state-of-the-art workspace and special purpose conferencing and training facilities. In FY 07, construction will begin to add engineering and laboratory workspace. Over 900 employees perform work in an environment that is host to over 40 software/computer engineering laboratories, plus adjoining high bays for tactical equipment operations. (SED)

Kiowa Warrior (OH-58D) Scout Helicopter Cockpit Procedures Trainer with Image Generator (CPTIG) Software Support Environment (SSE)

The CPT-IG SSE has the capability to maintain, support and upgrade CPT-IG Trainer software. The trainers are used at the Army Flight School, Fort Rucker, AL to assist in the training of Pilots, Co-pilots and Maintenance Test Personnel in operational/maintenance procedures of the actual aircraft. (SED)

Joint Technology Center/System Integration Laboratory (JTC/SIL)

A world-class facility unique in its ability to integrate multiple Unmanned Aerial Vehicle systems and test common subsystem integration interfaces. (SED)

Weapon System Interoperability Test Facility

Designed for weapon system software and communication testing, this is the only facility in the government having, in residence, Army deployed tactical air defense systems, Unmanned Aerial Vehicle C3 assets, and other ground and fire support weapon and C3 systems. It is regularly used for joint interoperability certification testing, AWE and field demonstration preparation, and soldier training. (SED)

Applied Imagery Lab (AIL)

The AIL is a center of excellence for integrating COTS imagery into tactical applications, particularly trainers and system-in-the-loop simulators for weapon systems. AIL focuses on providing low-cost, supportable, high-end PC-based technologies to solve real-time simulation problems. AIL leverages these PC products with in-house expertise to provide prototyping, development, integration, demo, and testing. (SED)

Army Air and Missile Defense Network Design Facility (AAMDNDF)

This facility provides JTIDS network designs and platform initialization load files for all Joint and Army-only tests, exercises, operations, and contingency events in which Army JTIDS-equipment units participate. The AAMDNDF is the Army's only JTIDS network design facility. Additionally, the NDF supports Army platform specific communications subsystem design, analysis, and testing for intra-Army, joint, and allied interoperability on this Joint mandated link. While routinely providing on-call technical support, the NDF is frequently called on to provide on-location support for tactical units deployed to field locations for exercises and contingency missions. (SED)

UH-60 System Integration Laboratory

This facility provides the equipment and resources to analyze problems reported by the user, conduct avionics tests, support airworthiness analysis and certification and produce components in conjunction with enhancing the Blackhawk fleet. (SED)

Unmanned Ground Vehicles (UGV) Laboratory

This facility is used for design, development, test and integration of robotic systems. The lab is used in the integration of technology from various sources including other Government facilities and commercial products. The lab is used to expose the user community to robotics and test new concepts of use. (SED)

Russell Measurement Facility (RMF)

The tower is 329-feet tall with an enclosed, 32x17 foot laboratory at the top providing a view of surrounding test ranges. One of two elevators serves as a measurements platform allowing variable look-down angle capability. The facility includes: fleet of tactical vehicles, track-mounted vehicle tilt/turn table, office space, rest facilities and both single and three phase power. The facility is utilized for the development of visible, IR and RF spectrum sensors/seekers, signature measurement collection of both air and ground vehicles, etc. (Applied Sensors, Guidance and Electronics Directorate)

Laser Countermeasures Laboratory (LCML)

The laboratory includes optical tables, mid-wave and long-wave IR laser sources, a blackbody target source, an ultraviolet background source, a flare simulator and optics to combine all of these, which present a realistic (range scaled) scene to an IR seeker. The LCML has been employed for (1) development of laser CCM under Army STO III.WP.2002.02, (2) determination of fundamental laser/detector effects and interaction, (3) evaluation of tactical, developmental and foreign IR seekers, (4) pretest simulation of US/UK laser/flare CM field tests, and (6) laser guidance link experimentation for CKEM. (Applied Sensors, Guidance and Electronics Directorate)

Longbow/Hellfire and Stinger Systems Integration Facility

This facility is used to design and evaluate the integration of launchers and missiles with aircraft and ground platforms. It provides the capability to assess hardware and software designs for entire weapon systems and supporting equipment such as test sets and training missiles. The Longbow/Hellfire and Stinger Systems Integration Facility currently supports Common Missile, Comanche, Aviation Rockets and Missiles Project Office, and SHORAD Project Office. (Applied Sensors, Guidance and Electronics Directorate)

Control Actuation System (CAS) Test Facility

The CAS Test Facility provides capability for development and testing of pneumatic, hydraulic, electromechanical and cold gas jet reaction control systems. Test equipment is available for measuring dynamic performance (stall torque, slew rate, hysteresis, and frequency response) of control systems. Pneumatic, hydraulic and electrical power supplies are used to support testing. Electronic diagnostic equipment includes oscilloscopes, data recorders, logic analyzers and frequency response analyzers. The CAS Facility has equipment for hydrostatic testing pressure vessels to 40 kpsi and pressurizing pressure vessels to 15 kpsi. The facility contains a six-component test stand, with instrumentation, for measuring the forces and moments generated by reaction control systems. The equipment available for measuring CAS performance consists of a Schlumberger 1250 Frequency Response Analyzer, Tetronix Digital

Oscilloscope, Gateway personal computer and a custom designed ATACMS Automated Test Stand that uses Lab View for data collection and analysis. The Control Actuation System Test Facility supports CKEM, Control Systems Technology and ATACMS. (Applied Sensors, Guidance and Electronics Directorate)

GPS Satellite Simulation Facility

The GPS satellite simulation facility consists of a GPS satellite simulator controlled by either a Silicon Graphics Origin 2000 or PC, depending upon the unit under test requirements. These simulators are capable of generating RF for a full satellite constellation for both military and civilian signals. The GPS simulators are used to evaluate: (1) total system navigation accuracy, (2) accuracy improvement enhancements (i.e., Local/Wide Area Differential, Wide Area GPS Enhancement (WAGE), pseudolites), (3) acquisition and reacquisiton performance, (4) effects of terrain or body masking, (5) satellite geometry and visibility effects including antenna-gain pattern modeling, (6) effects of vehicle dynamics, (7) effects of selective availability/anti-spoofing (SA/A-S) operation, (8) inertial navigation system (INS) aided and unaided performance and (9) interference (i.e., jamming) susceptibility. The GPS Test facility consists of three GPS satellite simulators used to test GPS receiver and integrated GPS/Inertial Navigation System (INS) hardware over a flight environment. The GPS simulator can be used in conjunction with a rate table, centrifuge, or vibration table. The GPS Test Facility supports project office programs including ATACMS, MLRS M270A1 Launcher, GMLRS as well as technology programs including Point-Hit MLRS, and Netfires. The GPS test facility has the capability of supporting any evolving weapon system that utilizes GPS receivers. (Applied Sensors, Guidance and Electronics Directorate)

Automated Laser Seeker Performance Evaluation System (ALSPES)

This facility provides complete open-loop test capability for semi-active laser (SAL) seekers/sensors operating at 1.064 microns. ALSPES provides characterizations on prototype/R&D hardware including specification compliance requirements, functional performance and active electro-optical countermeasures (EOCM) susceptibility. The modular equipment/software interface allows numerous systems to be tested with minimal changeover downtime. (Applied Sensors, Guidance and Electronics Directorate)

Laser Guidance Analysis Facility

This facility, which provides for real-time, closed loop evaluation of semi-active laser guidance hardware, has and continues to be instrumental in the development and life cycle support of such systems as HELLFIRE and Copperhead. It is currently being utilized in the development and demonstration of new laser guidance concepts for the Advanced Precision Kill Weapon System. (Applied Sensors, Guidance and Electronics Directorate)

Air Defense Radar Operations Facility

This facility consists of laboratories, experimental test equipment, including state-of-the-art test bed radar, and test ranges. The facilities are used to design, develop and test new advanced air defense radars as well as support of existing fielded systems. Hardware and software laboratory capabilities include development of advanced radar subsystem hardware and advanced signal processing algorithms with test on radar hardware. Advanced signal processing and algorithms include composite tracking with multiple radar platforms to perform data fusion and target identification. (Applied Sensors, Guidance and Electronics Directorate)

Compact Antenna Range

This facility consists of a folded compact antenna range including a computer-controlled, three-axis position table, parabolic reflector and RF sources for the measurement of antenna patterns including quantification of the effect of scan and radomes on the patterns. The range is qualified for RF frequencies from X to W band. Current sources are the Ka frequency band. This facility has been used to quantify RF antennas for LONGBOW, PAC-3 and various advanced technology developments. Additionally, the facility includes a Far Field Range that provides a capability for the laboratory development and test of radars transmitters and receivers. This facility has been utilized for the development of both Active Protections Systems and Counter Active Protection Systems and the evaluation of advanced phased array antennas. (Applied Sensors, Guidance and Electronics Directorate)

Automated Infrared Sensor Test Facility (AISTF)

The laboratory includes optical benches, calibrated blackbody sources, target plates, PC controllers and data recording and reduction hardware and software. This AISTF provides capability to perform both manual and automated performance evaluation of infrared seekers and sensors. Measurements include: a sensor's modulation transfer function (MTF), removing human subjectivity and the measurement of Noise Equivalent Temperature Difference (NETD) and Minimum Resolvable Temperature Difference (MRTD). The AISTF is used to establish benchmark performance testing of all infrared sensors/seekers. Support is provided to: (1) Avenger FLIR Upgrades, (2) NLOS-LS PAM, (3) STINGER Block II, (4) UAV sensor payloads and (5) Cooled/Uncooled SOA Sensor Development. (Applied Sensors, Guidance and Electronics Directorate)

Embedded Processor Laboratory

This laboratory provides the means to design, develop, fabricate and test embedded processor designs of missile flight computers and subsystem controllers for technology demonstrations and other missile programs. It consists of equipment for developing and testing both hardware and software and integrating the processors with other missile components. Capabilities include: (1) Schematic Capture, Hardware Development Language (HDL) Synthesis, and Field Programmable Gate Array (FPGA) Implementation and Simulation tools to create, implement and simulate the designs, (2) Printed Circuit Board Simulator to determine signal integrity due to routing, layer stack-up, line terminations, and path dimensions, (3) Multi-Channel High Speed Logic Analyzers, High Bandwidth Digital Oscilloscopes, and Protocol Analyzers to test and troubleshoot the assembled boards, (4) In-Circuit Emulators and Code Generation Tools for development, integration and test of software.

This laboratory currently supports the Guided Multiple Launch Rocket System (GMLRS) Cargo Round and Trajectory Correction Kit (TCK) programs. (Applied Sensors, Guidance and Electronics Directorate)

MEMS and Nano-Technology Clean Room

The MEMS and Nano-Technology Clean Room is a state-of-the-art, 800 square foot, Class 1000-capable facility used for development of micro and sub-micro scale sensors and systems. The clean room contains analysis and test equipment including a Scanning Electron Microscope and Probe Station. Devices developed and tested in this facility will be used for inertial and environmental sensor applications. (Applied Sensors, Guidance and Electronics Directorate)

Automatic Tracking Evaluation and Development System (ATEDS)

The heart of the ATEDS network consists of four SGI Octane computers running the IRIX operating system and equipped with V12 hardware graphics to support synthetic image generation. The network also includes over one terabyte of RAID disk drive space for storing captive flight test data for playing back actual data through simulations and to support the development of new tracking algorithms. (Applied Sensors, Guidance and Electronics Directorate)

Sensor Signal Processing System (SSPS)

The heart of the SSPS network consists of two real-time ATR systems with customized 300 Hz. cross-correlator engines. This facility consists of a high-speed, local-area network for implementation, development and assessment of target acquisition and ATR functionality for fire control and precision strike weapon applications. The SSPS currently supports NLOS-LS PAM and LAM, the Joint Attack Munition System (JAMS) Project Office and other evolving weapon systems that plan or potentially could make use of an advanced target acquisition capability. (Applied Sensors, Guidance and Electronics Directorate)

Capabilities at a Glance

Advanced Simulation Center

Advanced Prototyping Engineering & Experimentation (APEX) Laboratories I & II

Advanced Prototyping Engineering & Experimentation (APEX) Laboratory III

Javelin Simulation Center

Virtual Targets Center (VTC)

Aerial Targets Laboratory

Small Unmanned Aerial Vehicle Laboratory (SUAVL)

Aero-Optic Evaluation Center (AOEC), Large Energy National Shock (LENS) Tunnels I & II

Larry O. Daniel Prototype Integration Facility (PIF)

Automatic Test Equipment/Test Program Set (ATE/TPS) Laboratory

Automatic Test Equipment/Test Program Set (ATE/TPS) Sustainment Support Center (SSC)

Redstone Aviation Propulsion Test and Research (RAPTR) Facility

AED-A's Flight Control Technology Laboratory.

AATD's Countermeasure Test Facility

AATD's Structural Test Facility

AATD's Small Unmanned Aerial Vehicle Facility

AATD's Design and Analysis Facility

AATD's Experimental Fabrication Facility

AATD's Instrumentation Facility

AATD's Aviation Flight Support Facility

AATD's Vehicle Antenna Measurement Facility (VAMF)

Ballistic Test Facility (AATD)

Ducted Rocket Test Facility

Propellant Aging and Mechanical Properties Facility

Gel Propellant Rheology Facility

Signature Characterization Facility (SCF)

Composites Manufacturing Facility

Materials Facility

Modal Analysis and Visualization Equipment

Rocketball Test Facility

Microfabrication Laboratory

Anechoic RF Test Chamber

Platform Integration Laboratory

NASA Vertical Motion Simulator

Rotorcraft Advanced System Concepts Airborne Lab (RASCAL) JUH-60A (AFDD)

National Full-Scale Aerodynamics Complex (NFAC)

US Army AMCOM AMRDEC Life Cycle Software Engineering Center Complex

Kiowa Warrior (OH-58D) Scout Helicopter Cockpit Procedures Trainer with Image Generator (CPTIG)

Software Support Environment (SSE)

Joint Technology Center/System Integration Laboratory (JTC/SIL)

Weapon System Interoperability Test Facility

Applied Imagery Lab (AIL)

Army Air and Missile Defense Network Design Facility (AAMDNDF)

UH-60 System Integration Laboratory

Unmanned Ground Vehicles (UGV) Laboratory

Russell Measurement Facility (RMF)

Laser Countermeasures Laboratory (LCML)

Longbow/Hellfire and Stinger Systems Integration Facility

Control Actuation System (CAS) Test Facility

GPS Satellite Simulation Facility

Automated Laser Seeker Performance Evaluation System (ALSPES)

Laser Guidance Analysis Facility

Air Defense Radar Operations Facility

Compact Antenna Range

Automated Infrared Sensor Test Facility (AISTF)

Embedded Processor Laboratory

MEMS and Nano-Technology Clean Room

Automatic Tracking Evaluation and Development System (ATEDS)

Sensor Signal Processing System (SSPS)

Partnerships

DARPA/Navy MORPH Program effort to develop and demonstrate high-performance, non-linear, electro-optical polymers

NASA/MSFC - MOAs for the following technology development

Development of a micro-sized scanning electron microscope (SEM) for robotic material analysis

Development of Integrated System Health Management (ISHM) development of rocket fuel monitoring sensors both in the fuel storage and supply lines)

Establishment and operation of a joint laser-optics laboratory

Development of microfluidic chemical sensors

Development of monolithic ring laser gyroscope

Development of micro MEMS linear actuator

Investigation of photonic band gap devices

CRADA for the development of nonlinear optical materials with Alabama A&M University

AEGIS Technologies

Morgan Research

University of Alabama, Tuscaloosa

Vism Corp

SBIRs - involve the utilization of WS facilities and laboratories

DARPA Phase II SBIR with Time Domain Corp on Metamaterials

DARPA Phase II SBIR with Dymas Research Corp on Pulse Propagation in Negative Index Materials

RDECOM

Army Materiel System
Analysis Activity (AMSAA)

AMSAA
Excellence in Analysis

Army Materiel System Analysis Activity (AMSAA)

Aberdeen Proving Ground, MD 21005-5071

Mission

Providing analytical solutions to enhance Warfighter capabilities.

History

The U.S. Army Materiel Systems Analysis Activity (AMSAA) was established in 1968 in order to provide the Army with the professional systems analysis capability it needed to evaluate complex modern military systems. AMSAA gained the mission of test, design, and evaluation (TD&E) of major Army systems in 1975, acquired the Inventory Research & Logistics Studies Offices in 1981 and gained the independent logistician mission in 1991. AMSAA divested its TD&E mission in 1997. This marked AMSAA's shift away from the TD&E mission to our present mission of materiel and logistics systems analysis.
AMSAA's mission expanded to include acquisition and industrial base analysis, as well as manpower analysis, when the Industrial Engineering Activity at Rock Island Arsenal was transferred to AMSAA in 1998 and the Management Engineering Activity at Redstone Arsenal in 1999. AMSAA's technical and analytical expertise and knowledge of Army logistics, acquisition and the industrial base allow AMSAA to conduct crucial analyses for the U.S. Army and the Department of Defense so that our leaders can make informed decisions concerning the acquisition, procurement and support of the Army's forces.

Installation Overview

AMSAA is an element of the Army Materiel Command's Research, Development, and Engineering Command (RDECOM). AMSAA headquarters are located in Aberdeen Proving Ground, MD with additional offices in Rock Island Arsenal, IL; Redstone Arsenal, AL; and Letterkenny Army Depot in Chambersburg, PA. AMSAA's mission is to provide analytical solutions to enhance Warfighter capabilities. AMSAA's vision is to be the analytical organization of choice – providing credible and relevant systems analysis in response to Warfighter needs. AMSAA is a world-class analytical organization committed to giving the Soldier decisive capability to win across the spectrum of current and future military operations; providing analytical expertise to help guide the Army in selecting, acquiring, fielding, and sustaining new technologies; and developing the analytical workforce of the future.

Contact Information

U.S. Army Materiel Systems Analysis Activity
ATTN: Director, AMSRD-AMS-D
392 Hopkins Rd
APG, MD 21005-5071
410-278-6614 (COM), 298-6614 (DSN)
http://www.amsaa.army.mil/

Major Equipment/Facilities

Materiel and Logistics Analyses Facilities

AMSAA utilizes up-to-date information technology equipment, modeling and simulation and Army civilians (operations research analysts, engineers, computer scientists, physicists, mathematicians, logistics management specialists and management analysts) to conduct critical analyses. Facilities and equipment are available to conduct highly classified systems analyses.

Capabilities

AMSAA provides item and system-level analyses to support decisions throughout the materiel systems' life cycle, from technology development through production, sustainment and system disposal. AMSAA's performance, combat effectiveness and logistics analyses are used to address the capabilities and needs of conceptual, developmental and existing systems as well as technologies that will be integrated into the Current and Future Forces. The results of these analyses are used by U.S. Army and Department of Defense leadership to make informed decisions concerning the acquisition, procurement and support of the Army's forces. AMSAA is the Army's primary provider of certified materiel systems performance and combat effectiveness data. In serving this role, AMSAA is responsible for the generation and certification of performance and effectiveness data and for ensuring their standard use across Army and Joint studies. AMSAA has developed methodologies and models which use these data to characterize the functionality of Army materiel systems by accurately predicting critical performance variables. This capability supports the timely transition of warfighting technologies from the technology base to materiel and system specific applications. Many of AMSAA's analyses supporting decision making for equipping and sustaining the U.S. Army rely on analytical tools, methods, models and simulations that have been developed to represent, assess, and evaluate specific characteristics of the system(s) or technologies under study. AMSAA employs its modeling and simulation capabilities to support the development, linkage and accreditation of live, virtual, and constructive simulations and provide unique tools that support analysis of both individual systems and the combined arms environment. AMSAA is furthermore instrumental in the development, application, refinement and investigation of models to support both wholesale and retail Army logistics operations and analyses. AMSAA has tools available to generate required stock lists for each supply echelon based on combat damage and/or reliability failures, optimize on several variables including operational availability and cost and

determine optimal repair strategies. AMSAA also analyzes ways to improve the processes for designing, developing, acquiring and sustaining Army systems and components by managing AMC's Value Engineering Program and by analyzing the status of the industrial base and production lead times for developmental Army systems. Finally, AMSAA provides business process and manpower analyses and administers and executes the Management Engineering Program (MEP) for AMC and all its Major Subordinate Commands and Separate Reporting Activities

Capabilities at a Glance

- Conducting materiel system performance and effectiveness analyses, risk analyses, trade-off analyses and requirements analyses of Army systems for the Army Materiel Command (AMC), the Training and Doctrine Command (TRADOC), Battle Labs, the Army Test and Evaluation Command (ATEC), the HQ, Department of Army (HQDA) and the Department of Defense (DoD).
- Developing, certifying and maintaining performance and effectiveness data for armor, infantry, mine warfare, artillery, aviation, air defense and C4ISR systems to support major Army and DoD program analyses and initiatives.
- Developing and maintaining methodologies, models and simulations to support performance and effectiveness analyses of Army commodities.
- Conducting analyses in the areas of wholesale and retail logistics systems, primarily addressing supply, maintenance and reliability issues.
- Supporting AMC, program managers and other Army organizations in the conduct of resource analyses and cost/benefit studies to include cost versus performance/effectiveness trade-off analyses for Army weapons systems.
- Providing automation and analyses of the Army's industrial base information.
- Exercising overall program direction for the execution of the AMC management and engineering program to include the workload-based staffing analysis program (WBSAP) and commercial activity initiatives.

Partnerships

University of Maryland Center for Life Cycle Engineering (CALCE)

University of Maryland Center for Prognostics and Health Management(CePHM)

Sandia National Laboratory

University of Iowa

North Atlantic Treaty Organization (NATO Armaments Ballistic Kernel / NATO Indirect-Fire Appreciation Kernel)

The Technical Cooperation Program (TTCP) Joint Systems and Analysis Group (UK, Australia, Canada)

Joint Technical Coordinating Group / Munitions Effectiveness

Army Test and Evaluation Command / Army Evaluation Center

Program Manager Joint Attack Munitions (JAMS)

TRADOC Analysis Center - White Sands Missile Range

Program Manager One Semi-Automated Force (OneSAF)

Program Manager Future Combat System

Natick Soldier Center

Government of The Netherlands

Government of Germany

Physics of Failure Consortium (Government, Industry, Academia)

Center for Army Analysis

US Army Research Laboratory / Survivability and Lethality Analysis Division

U.S. Army Chemical Materials Agency

Defense Threat Reduction Agency

Joint Improvise Explosive Device Defeat Office (JIEDDO)

Joint Test Board

HQ AMC

RDECOM

Armament Research, Development and Engineering Center (ARDEC)

Armament Research, Development and Engineering Center (ARDEC)

Picatinny Arsenal, NJ 07806-5000

Mission

ARDEC is a business center of the U.S. Army Research, Development and Engineering Command (RDECOM) a major subordinate command of the U.S. Army Materiel Command (AMC). ARDEC provides the United States military with the firepower to achieve decisive battlefield victory which currently accounts for over 90 percent of the Army's lethality. Our mission is to execute and manage totally integrated life-cycle engineering processes required for the research, development, production, field support and demilitarization of ammunition, weapons, fire control and associated items. This includes engineering support for production and integrated logistics support. We provide management of initial production quantities and technical support to soldiers and equipment in the field throughout the entire life cycle. The primary function of ARDEC is to provide products that radically redefine warfare, enabling the American warfighter to dominate the battlefield.

History

In 1977, the government created the U.S. Army Armament Research and Development Center (ARRADCOM) to take charge of creating new and improving old weapons and munitions. Headquarters of the new command was on the site of the former Picatinny Arsenal in north central New Jersey.

In 1983, the Army disestablished ARRADCOM and placed its mission under its Armament, Munitions and Chemical Command (AMCCOM) at Rock Island Arsenal in Illinois. However, the bulk of weapons and munitions research and development remained at the Picatinny site, now called the U.S. Army Armament Research and Development Center (ARDC). In 1986, the Army ordered all its R&D centers to recognize an important aspect of their work with a name change, and ARDC became ARDEC, the U.S. Army Armament Research, Development and Engineering Center.

The name remained the same despite the center's transfer from AMCCOM to the Tank-automotive and Armament Command (TACOM) in 1994 and then to RDECOM in 2003. More importantly, the mission remained the same: developing high quality weapons and munitions for U.S. troops.

ARDEC developed items which proved their worth during Operation Desert Storm in 1991 including the warhead for the Patriot missile, the fire control systems and the ammunition for the Bradley fighting vehicle the Abrams tank and the laser guided Copperhead artillery projectile. These items were still in use 10 years later during the conflicts in Afghanistan and Iraq. Also playing in key role in Afghanistan was ARDEC's bunker defeat munition. Singled out for praise during the Iraqi fighting were the XM107 sniper rifle, the 120mm M919 and M830 high explosive-multi-purpose tank round, the M211 and M212 countermeasure flares, the M4 carbine, and several types of small arms ammunition and electric detonators.

Installation Overview

Headquartered at Picatinny, N.J., The U. S. Army Armament Research, Development and Engineering Center (ARDEC) is the Army's principle researcher, developer and sustainer of current and future armament and munitions systems. Additional site locations include: The Fuze and Precision Armaments Technology Directorate, Adelphi, MD; Firing Tables and Ballistics Team, Aberdeen, MD; The weapons Systems and Technology Directorate, Watervliet Arsenal, NY; and the Production of Field Support Team, Rock Island, IL.

ARDEC plays a key part in Army Transformation with its involvement in the development of the Soldier and Future Combat Systems and continued efforts in the development of advanced weapons that exploit technologies like high-power microwaves, high-energy lasers and nano-technology.

ARDEC's overall mission is to improve already fielded items, develop new ones, maintain a strong armament technology base in government, industry and academia, provide technical support to the Solider in the field and to execute and manage totally integrated life-cycle engineering processes required for the research, development, production, field support and demilitarization of ammunition, weapons, fire control and associated items.

Contact Information

U.S. Army Armament Research Development & Engineering Center
ATTN: AMSRD-AAR-EMB,
Picatinny, NJ 07806-5000
Phone: 973-724-7953
http://www.pica.army.mil/PicatinnyPublic/organizations/ardec/index.asp

Major Equipment/Facilities

Distributive Simulation Lab

The Distributive Simulation Lab uses high-performance computers and networks to simulate weapon systems and battles and to interoperate with live forces. Our software suite contains tools that can model individual rounds, weapon platforms and force structures to varying degrees of fidelity as apropos to the purpose of the analysis. In addition, we offer a robust 3-D visualization capability to enhance understanding of the analysis and to convey a sense of reality to an audience. Operations and analysis using the Distributive Simulation Laboratory can serve several purposes. The primary reason to use the distributed simulation approach is to define system requirements early in the acquisition life cycle. Candidate requirements are encoded into the simulated systems, and the systems are used either in a totally simulated combined arms environment or are used in a virtual sense by live troops in real-time. In this way, the pertinent requirements for the system are identified during the concept definition stage. Thus, the systems managers can avoid costly system characteristics that contribute minimally to real-world effectiveness.

Life Cycle Software Engineering (LCSE) Center

ARDEC's LCSE Center is a state-of-the-art facility consisting of the latest computer hardware, software and environments used for designing, developing, testing, managing, controlling, storing, fielding and maintaining Mission Critical Computer Resources (MCCR). Included in this MCCR are embedded software for Army Battlefield Automated Systems, Automated Trainers for Gunnery and Maintenance Institutional and Field simulators and trainers, in support of Army TRADOC Schools. The LCSE Center is one of the three charted Army Materiel Command LCSE Centers in support of all Army MCCR software.

Acoustic Technology Laboratory

This laboratory contains an electro-magnetic worldwide data collection and field measurement capability in the area of acoustic technology. Outfitted by NASA Langley with a multitude of acoustical data collection equipment and computers, this facility provides a clean, quiet, temperature-controlled and relatively dust-free laboratory environment. The Army's signature library for threat systems is maintained in this facility. Digital computers provide the capability for quick-look analysis, data reduction and display. Meteorological data collection instrumentation provides data on atmospheric conditions such as wind speed and direction, barometric readings (pressure), and relative humidity.

Wind Tunnel Laboratory

This facility consists of subsonic, transonic and supersonic wind tunnels to acquire aerodynamic data. Full-scale and sub-scale models of munitions have been assembled to sensitive laboratory instruments and mounted in the wind tunnels to measure their aerodynamic characteristics associated with flight stability, drag, spin rates and fuze arming at the velocities the test items would experience in service. The facility is typically used to evaluate munitions from the small arms ammunition arena to the large caliber artillery rounds. However, aerodynamic information may be collected on almost any item.

Arena Fragmentation Evaluation Facility

This facility is used to evaluate the lethality of fragmenting munitions. Arena's can be constructed up to 48-feet square, which translates into explosive weights up to 15 pounds. Fragmentation dispersion pattern and velocity are measured through the use of high-speed FASTEX cameras. Fragment size and weights are captured in Celotex panels then removed and weighed by a computerized weighing system. The resulting information is then evaluated for lethal area and effectiveness.

Armament Software Engineering Center

The Armament Software Engineering Center (ASEC) enhances ARDEC's traditional military roles as a center for armaments and lethality while expanding both lethal and non-lethal mission areas, capabilities, core competencies, system deployment, upgrades, improvements and Software Blocking compatibility and utilization. The ASEC emphasizes our Fire Control mission with situational awareness technology insertion which allows for reconfigurable Fire Control technologies, development and implementation. This state-of-the-art facility integrates centralized Capability Maturity Model Integration (CMMI) Level III software center capabilities to enhance mission objectives.

Armament Technology Facility

The Armament Technology Facility is a secure, environmentally-safe, integrated small arms and cannon-caliber design and evaluation facility. The ATF collocates simulation modeling, design, validation and diagnostic engineering with the capability to immediately conduct confirmation experimental firings of interior and exterior ballistics. This concurrent engineering facility supports multiservice infantry, air defense, aircraft and combat vehicle armament systems and is available to government and private industry. It has four weapons validation bays with an environmental chamber capable of weather conditions between -65 degrees Fahrenheit and +165 degrees Fahrenheit and two indoor ranges: one 100-meter range, and one 300-meter range.

Army Propellant Surveillance Laboratory

The Army Propellant Surveillance Laboratory is the only facility of its kind in the world. It is DoD's lead laboratory for ammunition surveillance and assures the safety, serviceability and economic use of the Army's war reserves by identifying potentially hazardous propellant lots and having them removed from the world-wide stockpile before a catastrophic auto ignition can occur. This laboratory performs testing on Army, Marine Corps, PREPO, and Navy assets. It is an internationally recognized leader for the breadth of experienced personnel, responsiveness, high quality control and

high volume test capability and advanced surveillance test and measurement techniques. It performs one of DoD's oldest and most aggressive safety missions with the primary mission to ensure the safety of our Soldiers by assuring that DoD has a safe, reliable, and ready inventory of ammunition. It plays a key role in ensuring DoD's propellant quality and ordnance reliability that begins with research and development and extends through test and evaluation, production, field maintenance, sustainment, environmental compliance, pollution prevention, accident and malfunction investigations and demilitarization. The facility houses a large analytical laboratory, a synthesis laboratory for preparing analytical standards, a thermal laboratory, an accelerated aging laboratory, environmental conditioning laboratory and is uniquely equipped to perform a high volume of testing annually (>22,000 analyses) in order to maintain a safe and reliable stockpile. High Performance Liquid Chromatography, Pseudo-kinetic Testing, Environmental Conditioning, Gas Chromatography, Infrared spectroscopy, Gel Permeation Chromatography, Differential Scanning Calorimetry, Reaction Rate Calorimetry, Karl Fischer Titration and Microcalorimetry are some of the techniques used in the propellant characterization and safe-life-assessment process.

Ballistic Rail Gun Soft Recovery Facility

The Ballistic Rail Gun Soft Recovery Facility accommodates a 155mm Howitzer that is fired horizontally into a long water trough to slow the projectile and recover the payload undamaged. Experimental items are loaded into the 155mm projectile and fired with energetic propellant to experience the in-bore setback, acceleration and spin of a typical projectile firing. Spin can be minimized by the use of the slip obturator to simulate smoothbore environments. The projectile is recovered intact in the water trough within five minutes of firing. This facility is used to evaluate projectiles, mine components, telemetry packages, components for guidance systems, whole guidance systems, fuzes and fuze components.

Breech and Tube Fatigue Test Facility

This facility has the capabilities of duplicating firing pressures in its breech mechanism and tube test facilities. It applies cyclic hydraulic pressure to pressurize vessels through either quasi-static or dynamic loading up to 120,000 psi. This allows the rapid evaluation of new concepts, materials and the establishment of safe firing lives for these components in the laboratory rather than the much more expensive test firing previously necessary. These combined facilities provide the Army with a capability not available anywhere in the free world.

Computer-Based Image and Signal Processing Analysis Facility

This facility is dedicated to image processing and signal processing as related to the design and implementation of measurement systems that support research and development. At its core is a supercomputer capable of 200-million 64-bit floating-point operations-per-second. This facility has unique peripherals including a one gigabyte-per-second Local Area Network which links the computer to high performance graphics workstations for visualization; a 14.4 million byte-per-second, digital, video tape recorder for the importing and digitization of images; and a million byte-per-second analog-to-digital converter for the digitization of analog data.

Davidson Advanced Warhead Development Facility

The Davidson Advanced Warhead Development Facility consists of a reinforced concrete dome, lined w/ armor plate, attached to a concrete tunnel for extended warhead-to-target standoff distances. The blast containment chamber is constructed of 12-feet thick reinforced concrete, lined with 1.5-feet thick armor plate, and capable of withstanding a 50 pound explosive charge (TNT equivalent). It is used to test shaped charges, EFPs and other experimental warheads in support of ARDEC's R&D mission and will accommodate heavy metal liners, such as tantalum and tungsten. Instrumentation includes flash radiography, framing/streak camera, digital still camera and electronic streak array. This facility will provide a safe, secure, cost-effective and environmentally acceptable means of conducting tests for terminal ballistic evaluation of armor-defeating warheads.

Depleted Uranium Fabrication/ Characterization

This laboratory is unique in that it is the only facility within DA certified to characterize and analyze DU and its alloys. It possesses specimen machining and preparation capabilities to conduct mechanical and environmental testing under a wide range of strain rates and includes the measurement of tensile/compression properties, fatigue life, fracture toughness, residual stress measurements and strain rate sensitivity. Additional analysis capability includes optical metallography, electron microscopy, x-ray diffraction, corrosion and stress corrosion testing.

Electromagnetic Environmental Effects Laboratory

This facility has the capability to expose systems to a wide range of severe electromagnetic environments. The systems' response to those environments is measured utilizing custom instrumentation designed and fabricated by E3 team personnel. E3 team engineers provide design guidance to ensure developmental systems will not be susceptible to electromagnetic environments to be encountered during their life cycle. Additionally, the E3 team serves as technical liaison with the Army Nuclear Survivability requirements community and test facilities. Hazards of Electromagnetic Radiation to Ordnance (HERO) ensure the safety and reliability of electrically initiated explosives in high electromagnetic radiation environments.

Electromagnetic Radiation, Operational (EMRO) evaluation ensures the safe, reliable operation of electronic systems in their anticipated electromagnetic radiation environment. This type of system evaluation is similar to the MIL-STD-461 radiated susceptibility test for subsystems. Other environments include Lightning Effects (LE) experiments, Electromagnetic Pulse (EMP) requirements, Electromagnetic Interference and Compatibility (EMI/EMC) measurements and Electrostatic Discharge (ESD) experiments.

Electronics Laboratory

The Electronics Laboratory is a fully equipped facility providing capability to support electronic product development from highly complex weapon system sensors, mine electronics and electronic warfare equipment to simple electronic devices. Experienced laboratory personnel provide design, fabrication, test evaluation, troubleshooting and failure analysis assistance for any type of electronic system, subsystem or component. In addition to a full complement of instrumentation, environmental test equipment and a prototype machine shop, the laboratory is in possession of a variety of software for design, simulation and analysis of electronic circuits through the media of computer-aided design/engineering (CAD/CAE). The laboratory and its personnel are an ideal source of electronic 'know how' for small and medium businesses seeking assistance in electronic product development.

Energetic & Engineering Materials Laboratory

The Energetic and Engineering Materials Laboratory (EEML) acts as the principal materials consultant and liaison with engineering organizations in the materials technology areas of composite/energetic materials, thermoplastics/thermosets, adhesives/sealants and lubricants. The laboratory seeks transition opportunities within the armaments community and other OGA's for basic research conducted by DOD, academia and industry. Resident within the EEML is the Adhesives/Sealants Joining Technology Laboratory which operates as the Army's center of expertise in engineering with adhesives and sealants and the Composite Materials Technology Facility which acts as the principal lightweight, composite materials process design and development consultant/liaison.

Energetic Material Demonstration Module Facility

This facility is unique to DOD. New energetic materials which are synthesized in the laboratory on the scale of grams can be scaled up to 50-100 pound quantities in order to optimize the process, provide material for further characterization in the laboratory and to provide experimental formulation of these new materials in explosives, propellants or pyrotechnics.

Energetic Material Reclamation / Processing R&D Facility

These R&D facilities are unique in their construction and equipment enabling the execution of numerous energetic material reclamation/processing programs. These programs include the reclamation of explosives for recycle/reuse, pink water treatment, high explosive loaded munition wash out, advanced explosive de-mil operations, explosive screening and melt pour of castable explosives.

Energetic Materials Analysis Laboratory

The Energetic Materials Analysis Laboratory is a recognized leader in the field of energetic materials chemistry and provides support to the tri-services, other government agencies (FBI, DEA), approved foreign governments, academia and private industry through analysis and testing in support of development of new ammunition, qualification of energetic material used in DoD munitions, life-cycle testing of fielded munitions, development of demilitarization and disposal processes and investigations of field malfunctions. The laboratory consists of a physical properties laboratory, a thermal properties laboratory, a metals laboratory, a wet chemistry laboratory and an instrumental laboratory for both organic and inorganic analyses. Instruments include GC-MS, DSC, TGA, FTIR, ICP-AES, Atomic Absorption Spectroscopy, Reaction Rate Calorimeter, Accelerated Rate Calorimetry, High Performance Liquid Chromatography, Karl Fischer Automated Titrator and Ion Chromatography.

Energetics Experimentation R&D Facility

This facility provides the capability for explosive testing of gun charges, ignition systems, recoilless rounds, pyrotechnics, fuzes, large caliber components, primers and mine dispersal systems. High and low temperature and humidity test cycling of solid or liquid explosive loaded components for functioning or for temperature gradient measurements is also available. Instrumentation capability consists of multiple tape and high-speed digital data channels with computer processing of pressure, force, temperature, strain, blast and other measurements.

Energetics Laboratory Facilities

These energetic materials laboratories are equipped with explosion-proof hoods with blow out walls for added safety, that are certified for safe handling of primary and secondary high explosives. Modern instrumentation for thorough analysis and characterization of new energetic materials is available. Analytical techniques available on site include high-field nuclear magnetic resonance spectrometry, Fourier transform infrared spectrometry, high-performance liquid chromatography, gas chromatography coupled with mass spectroscopy, atomic absorption spectrometry and UV-visible spectrometry. Equipment for process development and scale-up of energetic materials is available including jacketed reactor vessels and programmable heating and cooling circulators. Analysis of thermal properties of new materials is carried out using differential scanning calorimetry and thermal gravimetric analysis. Computational facilities include various personal computers and workstations and software for advanced molecular modeling and prediction of energetic performance characteristics of new materials.

Environmental Experimental Facilities

This large complex conducts environmental experimentation and evaluation of material during R&D, production and qualification programs. It contains numerous vibrators (electrodynamic and hydraulic), vertical shock machines, a HYGE horizontal shock machine, spin equipment and climatic chambers for temperature/humidity, altitude, salt spray and environmental stress screening (ESS). The facilities are equipped for on-line data monitoring and analysis of the equipment for both explosive and inert testing.

Experimental Explosive Pressing Facility

This facility supports R&D press loading for various warhead configurations including conventional warheads and those in early concept phase incorporating new explosive formulations. The facility houses a computer-controlled 190-ton press and a 420-ton press, an explosion-proof electrical oven and pressing support equipment such as hydraulic and vacuum systems. The 190-ton press supports double acting press loading of conventional and other novel explosives up to 105 mm in diameter for warheads. The 420-ton press can press warheads up to 150 mm in diameter. The computer-control capability provides accurate control, reading and recording of all pressing parameters, such as pressure, pressing cycles, vacuum, ram speed and temperature to provide optimal procedures for maximum performances of explosive formulations. This facility is operated remotely thus providing safe, cost-effective and environmentally friendly pressing operations.

Experimental Weapon / Armament Prototyping Facility

This complete manufacturing facility contains 250 pieces of equipment to include CNC, NC and conventional machine tools, heat treating, welding, inspection and associated support equipment to support the weapons R&D mission. This equipment is used for prototype development of test quantities on a wide variety of armaments. The uniqueness of this facility is in the varied type and the quality of the equipment it houses.

Explosive Development Facility

The Explosive Development Facility consolidates small-scale sensitivity diagnostics and research into one area and includes: two instrumented 10 pound experimental chambers, on-site dark room facilities with an automatic radiographic film developing, explosive preparation rooms and three 100 pound magazines on site.

Pilot Plant for Explosive Formulation

The Pilot Plant for Explosive Formulation supports the development of new explosives that are comprised of several components. This system is particularly beneficial for the development of Insensitive Munition (IM) explosives. The system consists of three remotely operated Brabender screwfeeders which feed the various explosive components to a formulation kettle. The system can be operated remotely. Explosive material produced using the IM Formulation Facility can be flaked for storage or processing using the Sandvick Belt Flaker.

Explosive Ordnance Disposal (EOD) Facility

The EOD Facility has the capability of performing examinations, measurements, photographing and limited x-ray of live ordnance items; remote disassembly of fuzes; and disassembly, stripping, and inerting as well as remote drilling, re-torquing and sectioning of ammunition for the purpose of supporting exploitation of new or first-seen foreign ordnance items. This facility satisfies the intelligence requirements of evaluating the threat that these items pose to the Army in the field and develops tools and procedures for EOD countermeasures.

Fire Control Integration Laboratory (FCIL)

The Fire Control Integration Laboratory (FCIL) is capable of accommodating a broad array of combat vehicles and towed weapon systems for integration and testing of various mechanical and electrical on-board components and subsystems, in a two bay, high-ceiling shop. Typically, hardware and software undergoing integration, debugging and testing is intended as a performance upgrade for a specific system through follow-on retrofitting. The FCIL contains a full complement of electrical instrumentation for system monitoring and data acquisition during testing, common shop tools, overhead lifts and cranes for removal and replacement of components weighing up to two tons and is heated for year-round, all season work.

Gun Dynamics Laboratory

The Gun Dynamics Laboratory is a research multi-task facility, which includes two firing bays, a high bay area and a second floor laboratory space. The high bay area is used for the investigation of structural dynamic response of heavy weapons and weapon components to launch excitation. The room is 80 feet x 40 feet with a high-load density floor. Instrumentation includes 12 channels of digital data capture and display in three synchronized Nicolet oscilloscopes with 4,000 points per channel. There is also a data acquisition system with 10 channels at 256,000 points per channel.

High-Energy Propellant Formulation Facility

This facility is used to conduct pilot scale propellant and igniter fabrication for experimental testing. This facility will assure that ARDEC preserves the knowledge base required for developing new propellant formulation and manufacturing techniques to provide superior service technical support to the military establishment while executing its primary mission: Army-wide development of propellant, igniters and manufacturing processes. This facility will produce single, double and triple base solvent and solvent-less propellants, and it will include the use of Thermo Plastic Elastomer material. Future composite propellants that may be based on high energy fillers such as CL-20, TNAZ, RDX and Octanitro Cubane can be used in a safe and environmentally clean operation.

Pilot Plant for High Explosive Loading

The Pilot Plant for High Explosive Loading includes various loading systems. The 50-gallon Melt Pour System includes a Grid Melter, Solids Flow TNT Feather Feeder, 50-gallon Melt Kettle, four-Nozzle Pour Machine and Cooling Ovens. It gives the Army a unique pilot scale melt-pour system for loading 155 mm M107 and M795 projectiles. The system is capable of loading projectiles using an air or water cooling process. This system is currently used to load projectiles with PAX/AFX-196 to support the 155mm IM development effort. Future plans include developing a pressurized pour system for loading viscous melt-pour IM explosives and utilizing the existing equipment to load a new version of the Bangalore Torpedo. The 75-gallon Melt Pour System, which includes an explosives Grid Melter, 75 gallon Melt Kettle, a 16-Nozzle Pour Machine and Steam Heated Cooling Ovens.

High-Speed Wind Stream Facility

This facility is one of only two high-speed wind stream facilities within the Department of Defense. It simulates the environment that countermeasure flares experience when they are dispensed in a free-fall manner from an aircraft. The facility contains air-handling apparatus that operates in the intermittent blow-down mode. It provides both constant and preprogrammed variable velocity-time profiles. The latter is achieved via a microprocessor-controlled valve. Flares are mounted at the exit nozzle of the air handling system and remotely ignited. State-of-the-art instrumentation measures and analyzes burn times, spectra and IR emission.

Hot Air Decontamination Facility

This facility provides for an environmentally compliant way to decontaminate metal and provides a means of safe disposal/recycling. The oven is utilized to decontaminate metal/process equipment that has been exposed to energetic material. This controlled heating process destroys the energetic contamination on the metal/equipment. This facility provides the Army with the ability to decontaminate material to a certifiable 5X contamination level by ARDEC Safety Office. It can decontaminate equipment with little to no disfiguration for safe reworking/welding/disposal, depending on type of metal and equipment configuration.

Instrumentation and Measurement System Facility

This suite of collocated facilities supports armament research, development, evaluation and manufacturing by addressing the needs of instrumentation and measurement systems. These instrumentation and measurement systems can be used for research, design, and development across a broad spectrum of disciplines. These include: acoustics, magnetics, Newtonian transducers (force, displacement, acceleration), analog circuitry, digital circuitry, microprocessor systems, control systems, software in high level and low level languages, and computer-aided design.

Intelligent Sensor-Based Robotics Laboratory

The ARDEC Automation and Robotics Laboratory has developed unique facilities and capabilities in the area of advanced sensor-based robotics control systems, distributed and cooperating robotics systems, advanced crew station architectures and embedded decision aids, voice/natural language machine vision and impedance control techniques. The laboratory has implemented and demonstrated an intelligent sensor-based robotics control system for two Puma 560 robots, instrumented with arm mounted cameras, force/torque sensors, range sensors, IR sensors and tactile sensors, which have the capability to cooperatively execute complex tasks communicated over a voice natural language interface.

Large Caliber Ballistic R&D Evaluation Area

This area is used to accommodate ballistic firing of conventional and experimental weapon systems, munitions, and propellant for caliber 40mm through 8-inch. Interior, exterior, and terminal ballistic data evaluation includes: pressure verses. time, muzzle velocity, acceleration, stress/strain, recovery, muzzle flash evaluation, projectile stability, Hadland digital range camera, FASTAX cameras, digital high-speed video, thermal measurements and weapon integrity. Data is recorded in real-time, allowing project engineers to evaluate each round as it is fired. Additional capabilities include the loading/modifying of standard and experimental propellant charges, along with support facilities such as service magazines, conditioning chambers, and material handling equipment.

Laser Survivability Laboratory

This facility was designed to emulate the defined laser threats so as to evaluate laser eye protection performance under realistic conditions. As presently configured, the facility is capable of duplicating all five defined threat laser wavelengths in terms of fluence and energy density and has the means for characterization of the laser beam for hot spots and shape. The lasers are used in conjunction with critically toleranced fixturing and highly sensitive electo-optical detectors to perform critical optical density (laser blocking performance) tests on devices and systems. The power of the lasers allows them to be used for evaluation of optics, both protected and unprotected, with regards to their susceptibility to laser damage.

Lubricants Laboratory

This facility is capable of providing the following services: lubricity determination of oils, greases, and solid film lubricants; corrosion prevention; firing residue removal determinations; compatibility determinations; and determination of physical properties of hydrocarbon products. Available equipment includes fales pin and vee block lubricant testers, four-ball wear lubricant tester, salt-spray chamber, humidity chambers, grease worker, penetrometer, flash point testers, high and low viscosity baths, cloud and pour point chambers, and an LFW-1 friction and wear tester.

Precision Armaments Laboratory

The Precision Armaments Laboratory (PAL) represents a new and unique mission-essential facility at ARDEC for smart weapon system research and development. This mission concentrates on the experimentation, development and evaluation of sensors and seekers during adverse weather conditions, and represents a new DoD capability that was not available previously. This capability will enable the development and fielding of precision ammunition that require “all weather” performance capability. The PAL consists of a 215-foot tower, a laboratory building and three target areas: short range (near the base of the tower), mid range (approximately 700m from the tower) and long range (approximately 1,300m from the tower). The tower is equipped with two unique laboratory elevators, one on the east face and the other on the north face of the tower, to be used to mount sensors for measurements at different heights and to simulate the descent of submunitions equipped with sensors. It also has seven platforms located at 40-foot intervals from which measurements can be made.

Powder Metallurgy Facility

The facility is uniquely equipped as the only laboratory within DA to conduct PM processing of refractory metals and alloys as well as the processing of a wide range of ferrous and non-ferrous alloys. The capability includes a broad range of furnaces/temperatures. Its consolidation equipment includes uniaxial compaction presses (up to 500 tons) and isostatic presses for cold and hot operation. The facility also possesses mechanical alloying equipment, as well as a plasma powder processing and material characterization capability. Extensive processing is conducted at this facility on advanced tungsten alloys for kinetic energy penetrator applications.

X-ray Imaging Technology Development Laboratory

ARDEC is the only DOD agency developing new technology to be implemented in state-of-the-art x-ray and neutron imaging systems. This technology includes unique x-ray tubes, unique and powerful electronic generated neutron sources, highly efficient digital radiation detectors and detector systems, multi-spectral radiographic imagers, cone beam tomographic imaging systems and automated software analysis of radiographs and tomographs. The impact to the military will be the ability to discern defects in materials with greater accuracy and certainty, to create portable x-ray units of considerably less weight for both Non-Destructive Inspection (NDI) and medical imaging, to increase the throughput for both medical and NDI imaging systems, to create neutron radiographic systems using neutron tubes rather than nuclear material and to create powerful and efficient neutron based mine detection and baggage inspection equipment.

Welding and Production Metallurgy Facility

This facility represents the only welding laboratory of its kind within DA. It is capable of conducting investigations associated with solid-state welding, overlay as well as other arc welding-related technologies. A new concept overlay band machine enables investigators to apply overlay rotating bands to projectile bodies of non-conventional design. The facility also features a state-of-the-art production machine.

Projectile Demilitarization Facilities

The Projectile Wash Out Facility is U.S. Army Ammunition Peculiar Equipment (APE 1300). It is a pilot-scale, wash-out facility that uses high pressure water and steam to wash out and demil projectiles as large as eight inch HE filled M106 projectiles. In addition to the Projectile Wash Out Facility, a Pink Water Treatment Facility is utilized to process all contaminated water wastes. The Autoclave Demil System can be used to demil 60mm, 81mm, 120mm, and 155mm projectiles. The system is also used to demil projectiles received from onsite EOD personnel. This includes foreign munitions recently removed from Southwest Asia. Explosives drained from the projectiles are captured in a 25-gallon Melt Kettle where the composition of the material can be analyzed utilizing Near Infrared (NIR) Compositional Analysis System.

Twin Screw Mixer/Fine Grind Facility

The 40 mm Twin-Screw Mixer/Extruder (TSE) pilot plant is a continuous, remotely operated, flexible facility that can significantly enhance safety and environmental considerations during the processing of energetic materials. Personnel exposure to hazardous operations is substantially reduced and equipment is in place to recover solvents utilized during material processing. The facility is available to support a broad spectrum of mission-related Research and Development including new propellant, explosive and pyrotechnic formulation development and insensitive munitions. The pilot scale TSE is corotating with fully intermeshing screw elements acting as a continuous mixer and compounder capable of continuously producing up to 50 pound/hour of energetic material. The facility is currently being operated to support a Life Cycle Pilot Process effort to demonstrate and validate a safe and reproducible process for the manufacture of black powder.

Nitramine Drying and Fine Grinding Facility

The Nitramine Drying and Fine Grinding Facility provides ARDEC with a state-of-the-art facility capable of drying and grinding high explosives (e.g., RDX and HMX). It is also available to support a broad spectrum of mission Research and Development including new propellant, explosive and pyrotechnic formulation development and insensitive munitions. It is capable of drying and grinding energetic materials and related raw materials up to 100 pounds per hour. The facility is currently undergoing inert operational testing.

RADAR Anechoic Chamber/RCS Measurements Laboratory

The facility's chamber was uniquely designed to provide radar characteristic measurements and data on projectiles. The information gathered within the chamber relates to the amplitude of a projectile's radar reflection as it rotates within the radar beam. This also includes measurement/evaluation of stealth capabilities of items under test. This technology has been used for artillery test programs to evaluate and improve projectile performance parameters such as range, yawing motion, spin, and position.

Rapid Prototyping Lab

This laboratory enables engineers to rapidly produce parts from their CAD models, typically one week for plastic parts and six weeks for metallic parts. The parts can be used directly for form, fit and function testing, used as masters for silicon molding of parts in other materials (polyurethane) or can be used as a replacement for the wax part in the lost wax investment casting process. The lab also provides 3-D CAD design services to customers on an as needed basis. As compared to an outside service bureau, the lab provides easier accessibility, scheduling flexibility, and one-on-one assistance with specific knowledge of the armament/ammunition design field.

Nanotechnology and Characterization Laboratory

The facilities include a wide range of apparatus for production, potential scale up and characterization of nanostructures. Facilities for production of nanostructures includes: a chemical vapor deposition oven system for production of carbon nanostructures, radio frequency generated plasma systems to scale up production of metal nanoparticles, rapid expansion of saturated solution (RESS) of fluids for production of nanocrystals, as well as facilities to chemically make and coat metal nanoparticles in oxygen-free environments. The available facilities for characterization include x-ray diffraction, Micro Raman spectroscopy, magnetic resonance spectroscopy, photo correlation spectroscopy for particle size determination, x-ray photoelectron spectroscopy, transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy and x-ray diffraction.

Molecular Beam Epitaxy Laboratory

This pilot facility for the production of optical waveguides is centered about the Molecular Beam Epitaxy (MBE) machine. This machine is an ultra-high vacuum machine containing ovens with gallium, arsenic, aluminum and dopants. Wafers of gallium arsenide are placed in the machine. Molecular particle beams from the ovens are directed towards the gallium arsenide wafers. Materials from the beams will condense on, and react with, material on the wafers to form layers of material. By proper etching of these layers, optical waveguides can be formed. In addition to the MBE machine, there are laminar flow clean benches and a chemical hood for the preparation of the wafers and the maintenance of parts for the MBE machine. Furthermore, there are means of characterizing the material layer produced. These include a Hall measurement system, electrochemical semiconductor profiler, an infrared spectrophotometer and other smaller instruments such as microscopes.

Molten Salt Deposition Facility

The purpose of the refractory metals electrodeposition pilot plant is to coat large caliber gun tube liners and metals having a higher erosion and corrosion resistance than chromium. It has the ability to electrodeposite metals such as tantalum, niobium, molybdenum and tungsten. All of these metals have very high melting points compared to chromium. The facility is composed of a vacuum chamber, two very large electric furnaces, gas handling equipment, salts purification equipment, rectifiers and computer monitoring and control apparatus.

Small Arms Simulator

The Small Arms Simulator is a single-lane computerized firing system with standard gun, M4 Carbine, converted for simulator use. Other weapons included in the simulator are the M203 Grenade Launcher and the M16A1/A2. All the guns retain their normal feel, operating characteristics and features. Recoil and noise are realistically simulated and shooting accuracy matches that of the original weapons. Graphical targets include pop-up, moving, stationary or multiple targets at various ranges as defined by the user.

DoD Center for X-Ray Diffraction

The Department of Defense's Center for X-Ray Diffraction at ARDEC is well recognized for its complete line of sophisticated X-Ray equipment, including two of the latest diffractometers and spectrometers, as well as for the comprehensive knowledge and experience of its personnel. The facility, which can have multiple uses, is currently used to enhance ballistic performance by determining the optimal crystal orientation of warhead and penetrator materials as well as Non-Destructive Testing (NDT).

Full Scale Investment Casting Foundry

Benet Laboratory's investment casting foundry provides the necessary base from which technical support is provided to the Laboratory in the form of the development of new castings and providing prototype castings, to Watervliet Arsenal in the form of production castings to meet initial deliveries until a contractor can start full deliveries, and to Outside Contractors in the form of technical assistance to overcome problems encountered in meeting the requirements of castings for production.

Nondestructive Evaluation Facility

This facility is used to nondestructively evaluate a wide variety of products and materials. Nondestructive Evaluation (NDE) is the examination of an object or material with technology that does not affect its future usefulness. NDE can be used without destroying a product or material. Because it allows inspection without interfering with a product's final use, NDE provides an excellent balance between quality and cost-effectiveness. The term 'NDE' includes many methods that can:

- Detect internal or external imperfections
- Determine structure, composition or properties
- Measure geometric characteristics. Some of the methods available in the facility include:
- Magnetic Particle,
- Dye Penetrant
- Eddy Current
- Ultrasonics. NDT can and should be used in any phase of a product's design and manufacturing process including materials selection, research and development, assembly, quality control and maintenance.

Ground-Based Hyper Spectral Imaging

Development is ongoing for hyper spectral (HS) scopes that operate in the visible to near infrared (VISNIR), the midwave infrared (MWIR) and the long wave infrared (LWIR). ARDEC's VISNIR prototype system currently operates with full data processing and visualization at a rate of two data cubes per second. The next generation will operate at a twenty to thirty data cubes per second. Unique sensors are being developed in all three spectral ranges that will operate at up to thirty cubes per second. Data rates of ten or more cubes per second is fast enough to replace current optical and infrared scopes that provide no spectral analysis with HS scopes that provide spectral analysis to discern and separate targets from background, greatly aiding the Warfighter in detecting and tracking targets. The next generation sensors are being designed to operate without cooling, to use very little electric power and to weigh little more than optical scopes. ARDEC's method of extracting meaningful information from the massive data cube and displaying it for instantaneous comprehension by the Soldier is unique and key to the success of HS imaging.

Energetics Rheology Laboratory (ERL)

The Energetics Rheology Laboratory houses a variety of instruments and equipment for the characterization of energetic materials, which include propellants, explosives, pyrotechnics, precursor materials (e.g., energetic thermoplastic elastomers (ETPE), binders) and non-energetic materials such as epoxies, composites and polymeric resins. All instruments are remotely controlled from a centralized control room via CCD surveillance cameras and computerized monitoring systems. The ERL is used to conduct various experiments and analyses of energetic and non-energetic materials. The ERL uses specialized software and data analyses programs, making the ERL a technically competent and unique site for performing energetic materials characterizations. Rheology is the field of science that relates the flow and deformation behavior of liquid and solid materials to their molecular structure and morphology. Manufacturing processes for conventional energetic materials, such as propellants and explosives, often involve complex flows under conditions of elevated temperature and pressure. Advanced and novel energetic propellant and explosive formulations are highly filled and manufactured into complex configurations. Knowledge of their rheological properties is necessary to process and finish them into complex configurations such as the co-layered discs or radial strips configurations. Processes include mixing, extrusion, casting, rolling, laminating and annealing. Therefore, experimental evaluation of specific rheological properties provides material data required to analyze processes. Equally important, data can be generated regarding the structure (molecular/macromolecular) and morphology of energetic fluids as they are being processed, as well as the solid-state rheological properties of energetic products.

Drop Tower

The Drop Tower provides for free fall testing of R&D munitions and can be dropped onto steel, concrete, water or other media to test suitability of munitions for deployment from aircraft, and the safety and structural integrity of an item and its packaging during shipping and handling. Test items can be dropped at a range of temperature based on the needs of the developer. On-board instrumentation is available.

Ammunition Surveillance/Inspection Testing Lab

The Ammunition Surveillance/Inspection Testing Lab is a computer facility for the design, development and testing of computer software and databases developed by the Automated Test Systems Division. The major software applications supported by this facility are: Ammunition Surveillance Information System (ASIS), a portable, computer-based, electronic library of thousands of publications, ammunition drawing and reference materials used by ammunition inspectors to ensure global ammunition safety and readiness; ASIS/Munitions History Program (MHP), an internet-accessible database of ammunition inspections used to determine the readiness status of the global munitions stockpile managed by the Joint Munitions Command (JMC); Automated Test Systems (ATS) Database, a database used to support the life cycle management and configuration management of technical data, hardware, software, and documentation.

Combat Vehicle Diagnostics / Prognostics Laboratory

ARDEC maintains a full-range Diagnostics/Prognostics Laboratory for the research, development, testing and support of Embedded Diagnostics/Prognostics, Built-In Test, At-System Diagnostics, Software Downloaders (also known as Software Loader/Verifiers), Automated Software Testing and System Emulators. The lab is equipped with full diagnostics development environments for supported weapon systems, consisting of actual system hardware and subsystem emulators. Our facility is also equipped with all At-System ATE (Automated Test Equipment) required to support our customers, including the IFTE Soldier's Portable On-System Repair Tool (SPORT) and Maintenance Support Device (MSD) utilized by the Army and the Panasonic ToughBook utilized by the Marines. The laboratory staff consists of engineers, scientists, technicians and contractors specializing in Diagnostics, Software Downloaders and Automated Software Testing. Some of the systems supported include the Paladin M109A6 Self-Propelled Howitzer, M777 Lightweight Towed Howitzer, Mortar Fire Control System (used on M1064 and Stryker), Crew Remote Operated Weapon Station (CROWS), and the IPADS inertial navigation system.

Automatic Test Equipment Lab

The Automated Test Systems Division (ATSD) has assembled facilities to support the on-site development of Test Program Sets (TPS) for Weapon Systems. These systems are representative of all TACOM ATS used for direct support and Depot Testing of electronic components.

Warhead Design Facility

The Warhead Design Facility has the capability to design new warhead concepts on the computer using the latest computer codes. It optimizes warhead designs for increased lethality using these codes. Associated on-site facilities exist for machining the metal parts, explosive loading and test firing these designs against a variety of targets. New explosives can be loaded and tested in warheads to optimize the explosive/metal interaction. In addition, there are ARDEC developed warhead design codes for the most accurate and fastest development cycles which minimize costly fabrication and test phases.

Virtual Prototyping / Virtual Reality Simulation Laboratory

Virtual Prototyping (VP) supports and accelerates the Acquisition process through interactive, synergistic models and simulations. VP achieves its many benefits through realistic simulation of hardware in virtual environments by real users far in advance of any operational end products or static physical mockups. Virtual Reality (VR) Simulation fully immerses the user into a synthetic environment suitable for true user-in-the-loop evaluation of emerging technologies. Users are able to rapidly evaluate and interact with which is only a computer based 'notion' in a realistic environment. VP/VR allows for many design iterations in place of costly physical fabrications, bringing the power of real-time 'what-if' computer analysis. SBA/SMART (Simulation Based Acquisition/Simulation and Modeling for Acquisition Requirements and Training) are two Army-wide initiatives that are supported by VP/VR. VP models and VR simulations not only support traditional item development, but also allow real-time user in-the-loop logistical, maintenance, training and requirements evaluations of concept weapons systems, early in the design cycle. These permits robust designs that are more sustainable, producible and more effective when produced.

Vessel Plating Facility

This facility was developed specifically to deposit high-performance bore coatings inside long gun tubes. It can accommodate cylinders up to 26 feet in length and studies can be conducted on fluid dynamics in turbulent annular flows with strong magnetic fields causing heat and mass transfers. This facility is unique in that the cylinder whose interior is being plated actually serves as the plating vessel. This process negates the need to submerge the entire object into a potentially corrosive salt bath. The ends of the cylinder are capped and the plating solution is pumped through the cylinder. This is extremely effective in plating cylindrical objects when only the interior requires plating or the exterior cannot tolerate plating.

Thin Film Optical Coating Laboratory

This lab is utilized for research of optical coating materials and development of the processes for deposition of thin film coatings onto optical components of fire control sights and systems. This facility when tied with resident CAD programs for coatings provides the means for carrying optical coating R&D from concept through prototype. Initial efforts in the development of laser protection coatings for Army fire control sights were conducted using these facilities and the resulting laser-blocking filters were supported through production and fielding again using the resident capabilities to verify processes and evaluate materials. The laboratory houses five electron-beam guns, high vacuum deposition chambers capable of depositing Mil-Spec quality optical coatings for use in the near ultra-violet, visible, and near infrared regions of the electro-magnetic spectrum. The facility has produced prototype dielectric interference coatings, metallic optical mirrors, and transparent electrically conductive semi-metal films. A dual-beam spectrophotometer, capable of measuring spectral performance of coatings in all regions of interest, and environmental chambers, capable of assessing performance during or after exposure to military environments, are maintained

Rotary Forge

Cannon tube forgings are conventionally produced by press forging an ingot into a solid cylinder with approximate external dimension. Rotary forging produces hollow cannon tube forging, with dimensional control comparable to a machined press forging. A heated preform is automatically transferred to the rotary forging machine, where it is automatically forged into a hollow tube, using numerical control.

Test Program Set (TPS) Laboratory

The ARDEC TPS Laboratory provides an organic Test Program Set (TPS) development, maintenance, and life cycle management capability for DoD LCMC materiel developers. Although its primary responsibility is to Army TACOM LCMC, its capabilities have attracted other DoD material developers. Current TPS customers are Ml Abrams, M2 /M3 Bradley Family of Vehicles, LW155 Towed Artillery Digitization (TAD), Common Remote Operated Weapon (CROWS), Marine Corp LAV, Kiowa Warrior Remote Rocket Assembly, and M109A6 Paladin. The laboratory has a large in-house knowledge base of engineers, scientist, technicians and contractors who have experience developing TPSs, separating it from other LCMC support centers. Their experience includes the following Automatic Test Equipment (ATE) platforms: IFTE V3, IFTE V5, Aurora (Mantech VTS-1000), Marine Corp TETS, ADADS, AN/USM410 EQUATE, AN/USM-465 (Genrad 2225A), DSESTS, Huntron, and DIT-MCO.

Thin Film Deposition Laboratory

This is a unique facility used for exploratory development and fabrication of thin films and membranes. The primary feature of this facility clean room. It contains multiple thin film deposition chambers, photolithography (1 micron) process equipment for imaging and developing metal and polyamide layers, anodizing and automated electrical test equipment. The Clean room is a Class 100, vertical flow facility (Class 100 = less than 100 particles of contaminant of 0.5 micron (0.000001 meter) in size per cubic meter). One room contains three vapor deposition chambers for applying thin films of metals or insulators up to three microns thick. Two rooms contain photolithography equipment for imaging and etching the above films with dimensional accuracy of 1 micron. The last room contains space for electrical testing of the fabricated devices. Connected externally to the Clean room are a de-ionized water plant (pure H2O) and the A/C system to control temperature and humidity.

Telemetry Engineering Laboratory

This unique, state-of-the-art facility supports the design and development of high-shock, miniature telemetry systems. The facility includes the latest in CAD/CAM software and equipment for the design, layout and fabrication of telemetry systems and extensive special purpose equipment for the check out, test and calibration of these systems

Remote Machining and Evaluation of Explosively Filled Munitions

This facility is used for remote machining of explosively loaded ammunition. Munition sizes from small arms through 8-inch artillery can be accommodated. Sectioning, debulleting, lathe turning, milling, drilling, crimping and detorquing capabilities are available. Typical uses include surveillance testing of high explosive filled warheads, malfunction investigations, evaluation of experimental munitions and disassembly, modification and preparation of explosively loaded projectiles. Evaluation capabilities include Air Gun launching, high-speed photography, Explosively Formed Penetrator (EFP) and Shaped Charge warhead evaluation, Flash x-ray, Fluoroscope, Mass Properties, Satellite machine shop, Insensitive Munitions tests, Fast and Slow Cook-off testing and armor penetration evaluation.

Radiological Analysis and Development Facility

This facility is used to nondestructively examine items including explosives, and to investigate automated, real-time radiographic technology. It is useful in examining a wide range of items including fuzes, flares, rocket motors, and shells. The 180 degree panoramic X-Ray beam is put to maximum advantage through the use of a continuous, carousel-type conveyor. This heavy, precision-built system carries the items being inspected and X-Ray films through the X-Ray beam on a continuous basis without vibration or adverse motion. It permits the processing of large quantities of items in relatively short periods of time. The facility includes solid concrete walls.

Reliability Physics / Failure Analysis Laboratory

The Reliability Physics / Failure Analysis Laboratory performs reliability assessments and failure analysis studies of electronic components and systems. These include discrete, integrated and hybrid electronic components both active and passive, subassemblies and assemblies including printed wiring boards, solder joints and interconnects, mechanical systems including single components, timers and S & A's, electro-mechanical components and systems, and optical and electro-optical components and systems.

The Reliability Physics / Failure Analysis Laboratory provides excellent capabilities. The Scanning Electron Microscope (SEM), equipped with both wavelength and energy dispersive spectrometers, enables the observation of microstructures and performs full elemental (both qualitative and quantitative) analysis. The SEM can produce images with resolutions as fine as 4nm. The laboratory contains all the equipment required to sample preparation and surface analysis, including high quality optical microscopes, carbon and gold coaters and a dedicated machine shop. Coupled with other fine facilities in the A&IFD Laboratories, this lab can perform a number of analytical techniques in the area of semi-conductor failure analysis, such as voltage contrast and current induced failure detection. In the voltage contrast mode, a suspect device can be lowered while being examined with the microscope. All positively charged metalization runs will appear dark while negatively charged runs will appear light. While functioning, isolation of defective areas can easily be accomplished

Pyrotechnic Pilot Manufacturing Facility

This facility encompasses the entire range of R&D related to pyrotechnic formulations and items including both processing and testing capabilities. Processing is done at the small pilot plant level and includes mixing, granulation and drying of pyrotechnic composition and consolidation and loading of powder into items. Test capabilities access the thermodynamic, kinetic, physical and storage stability characteristics of pyrotechnic compositions using assorted equipment. In addition, a flare tunnel with the most current equipment and instrumentation is used to measure the burn time, radiometric, photometric and spectral characteristics of a wide range of pyrotechnic items. This facility can provide quick development of novel pyrotechnic items and transition to production.

RADAR Engineering Facility

This remote facility provides the means of developing, testing, maintaining, servicing, calibrating and evaluating radar measurement systems. The facility includes: a secure, safe, outdoor, radar radiation test area; a high-power, tower-mounted, radar calibration system that supports two Advanced Hawk Radar Velocimeters (AHV) valued at $1.2 million each; a remote control video system to interface the AHV two large radar equipment bays; radar control and record analysis labs; and associated recording, acquisition, and development equipment systems.

Product Evaluation Laboratory

The Product Evaluation Laboratory is comprised of Dimensional Inspection and Materials Testing. The Dimensional Inspection facility offers the services of highly trained and experienced specialists that have a full complement of measuring equipment. It is equipped with two optical Comparators and a Coordinate Measurement Machine (CMM). The lab specializes in all types of physical evaluations, including engineering evaluations, first article tests, product configuration audits and malfunction investigations. The CMM is a computer-aided three axis machine that uses touch probes to perform measurements. Reports can be computer generated and sent anywhere via e-mail. The Materials Testing facility provides testing and evaluation services including tensile, compression, shear, hardness, and temperature/humidity conditioning. These services are available to satisfy a wide range of customer needs in a timely, cost-effective manner.

Powder Gymnasticator

The powder gymnasticator provides for the evaluation of large caliber experimental gun mounts and recoil mechanisms by subjecting the recoil mechanisms to the same impulse as the full-scale firing of the weapon. The chamber is loaded with propellant and fired, simulating the recoil forces associated with a full-up live firing. This method is extremely cost effective; projectiles, and full-scale propellant charges are not needed. Additional environmental savings are realized through reduced noise levels. The powder gymnasticator can accept forces up to 2.5 million pounds. Instrumentation includes pressure vs. time, rod-pull gages, hydraulic pressure, stress/strain, and metal parts integrity.

Precision Optics Boresight Alignment & Assembly Facility

These facilities are used to test manufacturing samples of precision optics including: binoculars, gunnery sights, quadrants, aiming circles. Large clean rooms, a optical collimator, isolation benches, a variable wavelength laser and scanning microscopes are available.

Pit Fragmentation Facility

This facility contains steel tubs in which experimental munitions are exploded while covered with sawdust. The sawdust is automatically screened following detonation and the resulting fragments are magnetically removed for analysis. Also available is a four foot diameter sphere for small fragmenting small munitions and an eight foot diameter by 12 foot high water tank where non-ferrous munitions can be detonated and recovered. A computerized fragment weighing system sorts the fragments by weight and provides a detailed analysis by size and weight.

Nanotechnology Laboratory

ARDEC now has the largest radio-frequency plasma-based nanoparticle reactor in North America once something only comprehensible in science-fiction. The reactor is the first of a series of flexible pilot lines to create a nanotechnology center. The new pilot facility can produce one kilogram per hour of nanoparticles using a variety of materials. Possible uses for nanotechnology cover a wide spectrum of needs, ranging from integration into weapon and equipment systems that support Soldiers fighting in the war on terror to health care and cosmetics to electronics and telecommunications. We expect to use this capability to rapidly prototype improved defense systems on behalf of the DoD and commercial partners looking at applying nanotechnology to improving lethality. The new facility serves as a key element in New Jersey's Nanotechnology and Economic Development strategy.

Capabilities at a Glance

Distributive Simulation Lab

Life Cycle Software Engineering (LCSE) Center

Acoustic Technology Laboratory

Wind Tunnel Laboratory

Arena Fragmentation Evaluation Facility

Armament Software Engineering Center

Armament Technology Facility

Army Propellant Surveillance Laboratory

Ballistic Rail Gun

Breech and Tube Fatigue Test Facility

Computer-Based Image and Signal Processing Analysis Facility

Davidson Advanced Warhead Development Facility

Depleted Uranium Fabrication/ Characterization

Electromagnetic Environmental Effects Laboratory

Electronics Laboratory

Energetic & Engineering Materials Laboratory

Energetic Material Demonstration Module Facility

Energetic Material Reclamation / Processing R&D Facility

Energetic Materials Analysis Laboratory

Energetics Experimentation R&D Facility

Energetics Laboratory Facilities

Environmental Experimental Facilities

Experimental Explosive Pressing Facility

Experimental Weapon / Armament Prototyping Facility

Explosive Development Facility

Pilot Plant for Explosive Formulation

Explosive Ordnance Disposal (EOD) Facility

Fire Control Integration Laboratory (FCIL)

Gun Dynamics Laboratory

High-Energy Propellant Formulation Facility

Pilot Plant for High Explosive Loading

High-Speed Wind Stream Facility

Hot Air Decontamination Facility

Instrumentation and Measurement System Facility

Intelligent Sensor-Based Robotics Laboratory

Large-Caliber Ballistic R&D Evaluation Area

Laser Survivability Laboratory

Lubricants Laboratory

Precision Armaments Laboratory

Powder Metallurgy Facility

X-ray Imaging Technology Development Laboratory

Welding and Production Metallurgy Facility

Projectile Demilitarization Facilities

Twin Screw Mixer/Fine Grind Facility

Nitramine Drying and Fine Grinding Facility

RADAR Anechoic Chamber/RCS Measurements Laboratory

Rapid Prototyping Lab

Nanotechnology and Characterization Laboratory

Molecular Beam Epitaxy Laboratory

Molten Salt Deposition Facility

Small Arms Simulator

DoD Center for X-Ray Diffraction

Full Scale Investment Casting Foundry

Nondestructive Evaluation Facility

Ground-Based Hyper Spectral Imaging

Energetics Rheology Laboratory (ERL)

Drop Tower

Ammunition Surveillance/Inspection Testing Lab

Combat Vehicle Diagnostics / Prognostics Laboratory

Automatic Test Equipment Lab

Warhead Design Facility

Virtual Prototyping / Virtual Reality Simulation Laboratory

Vessel Plating Facility

Thin Film Optical Coating Laboratory

Rotary Forge

Test Program Set (TPS) Laboratory

Thin Film Deposition Laboratory

Telemetry Engineering Laboratory

Remote Machining and Evaluation of Explosively Filled Munitions

Radiological Analysis and Development Facility

Reliability Physics / Failure Analysis Laboratory

Pyrotechnic Pilot Manufacturing Facility

RADAR Engineering Facility

Product Evaluation Laboratory

Powder Gymnasticator

Precision Optics Boresight Alignment & Assembly Facility

Pit Fragmentation Facility

Nanotechnology Laboratory

Partnerships

3M

Aerojet General

Armtec Defense Projects

ATK

BAE Land Armament Systems

Barrett Firearms

Coherent Logix, Cybernet Systems, Intelligent Automation, Robotics Research, Chi Systems, Declog, S International, Galaxy Scientific, ProLogic

Foster Miller, QUINETIQ, Taser International, Aegis

General Dynamics

Honeywell International

Insitech

Kigre

L-3 Communications

McDonnell Douglas

New Jersey Institute of Technology

Northrop Grumman

Pennsylvania State University

Stevens Institute of Technology

Texas Tech University

University of Florida

University of Maryland

Polymer Technologies

Renssalaer Polytechnic Institute

RTI International Metals

Rutgers University

Savit

Textron

Universities of Mississippi

New York at Buffalo and Texas at Austin

Curtis Wright Electromechanical

DRS Test and Engineering Management

BAE System

University of Pittsburgh, CACI

Villanova University

Western Design

DEAs/IEA

Canada
Mine, Countermine and Demolition Technologies

France
Development of Land Mines

Energetic Substances

Medium Caliber Ammunition and Weapons

Field Artillery Weapons Systems, Ammunition, Fire Control and Propellant Charges

Appraisal Of Safety And Suitability For Service For Non-Nuclear Munitions

Germany
Field Artillery Weapon Systems -- Towed and Self-Propelled Guns and Howitzers

Automatic Gun Systems

Land Mines

Fuzes

Demilitarization and Disposal of Conventional Munitions

Energetic Materials

Mortar Systems

Israel
Artillery Systems

Infantry Weapons

Japan
Artillery Technology

Small Arms Technology

Korea
Conventional Munitions

Conventional Firearms, Recoilless Rifles, Mortar and Artillery Weapons

Mine Laying Systems and Land Mines

Norway
Mortar Systems

Poland
Technologies for High Explosive Warheads

South Africa
Artillery and Mortars

Singapore
Indirect Fire Systems

Infantry Weapons and Munitions

Energetic Materials

Sweden
Artillery and Mortar Weapon Systems and Munitions

Mines, Countermine and Demolitions Technologies

Energetic Materials

Switzerland
Army Weapons and Ammunition

United Kingdom
Direct Fire Systems

Indirect Fire Systems

Energetic Materials

Mine and Demolition Technologies

Tank Main Armament Systems

Infantry Weapons and Munitions

Weapons Safety and Suitability for Service of Non-Nuclear Munitions

Project Agreements:

Australia
Land-Based Acoustic Surveillance System

Korea
Insensitive Munitions

Academia

Stevens Institute of Technology

Florida Institute of Technology

Fairleigh Dickinson University

County College of Morris

Rensselaer Polytechnic Institute (Benet)

RDECOM

Army Research Laboratory (ARL)

Army Research Laboratory (ARL)

Adelphi, MD 20783-1197

Mission

Provide innovative science, technology and analyses to enable full-spectrum operations. America's Laboratory for the Army: Many Minds, Many Capabilities, Single Focus on the Soldier. Acknowledged for scientific, technical and analytical excellence. Recognized as the bridge between the scientific and technical community and the Army. Leader in providing innovative solutions for the current and future Army.

History

The U.S. Army has had research facilities dating back to 1820 when the laboratory at Watertown Arsenal in Massachusetts studied pyrotechnics and waterproof paper cartridges. This facility and would evolve into the Materials Technology Laboratory. Most pre-WWII military research occurred within the military by military personnel, but in 1945, the Army published a policy affirming the need for civilian scientific contributions in military planning and weapons production. Non-military involvement before this time was frequent; however, methods for contribution to warfare technology were on limited and incidental basis. In June 11, 1946, a new research and Development Division of the War Department General Staff was created; however, due to internal forces within the military which supported the traditional technical service structure, the division was closed. A variety of reorganizations took place over the next fours decades, which put many organizations in command of U.S. Army research and development. Often, commanders of these organizations were advocates of the reorganization while some members of middle-level management were opposed to the change.

Installation Overview

ARL laboratory facilities are located at three main locations: the Adelphi Laboratory Center, Adelphi, MD; Aberdeen Proving Ground, MD; and White Sands Missile Range, NM. Additional locations include co-location with NASA facilities at Langley Research Center, Langley, VA and Glenn Research Center, Cleveland, OH. ARL's Army Research Office is located at Research Triangle Park, NC. ARL Human Research and Engineering field elements are co-located across the country with TRADOC schools and centers and with AMC Research and Development activities.

Contact Information

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Major Equipment/Facilities

Ground Vehicle Research Facility

This course is used for unmanned vehicles and indirect driving studies. It has several hills and small ridges so that study subjects cannot see the entire course at one time and to provide terrain to create vehicle pitch, roll and motion in the "Z" direction. An instrumentation trailer serves as a control room. Driving paths include a simple figure eight that is used to train subjects and a path containing straight a ways, slaloms, tight turns and straight and broad paths in which obstacles such as logs and rocks must be avoided.

Tactical Environmental Simulation Facility (TESF)

ARL's Hostile Environmental Simulator was incorporated into an expanded Tactical Environmental Simulation Facility in FY02. This facility integrates, under one roof, the Omni-Directional Treadmill (ODT) into virtual visual and auditory environments to enable repeatable, laboratory-controlled investigations of critical Soldier issues for FFW and permits multi-sensory immersion of the Soldier into an environment which may vary from benign to hostile without exposing the subject to the hazards and variability of outdoor experimentation.

Advanced Material Growth and Processing Facility

This is the Army's most extensive facility of its type and contains six elemental, dedicated, state-of-the-art molecular beam epitaxy and one metal-organic, chemical-vapor deposition systems. These systems enable the growth of advanced III-V and II-VI semiconductors used in numerous optical (lasers, detectors, etc.) and electronic (FETs, thyristors, etc.) components.

Specialty Electronic Materials Devices Class 100 & Class 10 Cleanroom Research Facility

This facility has deposition, characterization, and photolithography systems. These systems enable the patterning and fabrication of advanced Nano Devices, Microelectromechnical Systems and III-V and II-VI semiconductors used in numerous bio and trace-gas detection, RF (resonators, switches), power generation (micro turbine, energy harvesting), optical (laser, detectors, etc.) and electronic (FETs, thyristors) components.

High-Temperature Power Electronics Facility

This facility conducts research and development providing DoD with unique capabilities. SiC devices can be stressed under application-specific (inductive motor load) circuit stresses at case temperatures between -20 degrees to +220 degrees Celsius. High-temperature device characterization capabilities include wafer level I-V, C-V, G-V characterization to 450 degrees Celsius.

Nonlinear Materials Characterization Facility

The protection of US Army personnel and sensors from laser threats on the battlefield is a critical concern. ARL is working with TARDEC and NSC to design, develop and evaluate candidate non-linear optical approaches to minimize or eliminate the threat posed by frequency agile lasers to the optical sensors utilized by the Army and Soldiers vision.

Power Conditioning Research Facility

This research facility provides a unique collection of power sources, energy storage devices, power loads, thermal management systems and electronics fabrication resources for the study of high-power, power-conditioning systems. Specialized systems for pulsed power and continuous power circuit development are available, and these capabilities are being expanded to address the needs of new technologies such as high-power, solid-state switches and electric traction drives.

Millimeter-Wave Instrumentation Test Facility

Basic research is conducted in propagation phenomena, remote sensing and target signatures. The facility is unparalleled in the breadth and depth of its instrumentation and analysis capability. Supporting tools include high-speed data acquisition, multiple band Radars analysis systems, visualization tools and model generation for performance evaluation. This facility includes outdoor experimental facilities.

Microelectromechanical Systems (MEMS) Research Facility

The facility provides DoD with a state-of-the-art capability for designing and fabricating micro-and-nanoscale electromechanical and opto-electromechanical, and electronic devices and sensors for a wide variety of applications. Battlefield applications include MEMS/NEMS and nanoelectronic devices for power, multifunction RF, communications, chemical and biological sensing, networked microsensors and guidance and control. Unique capabilities include the ability to conduct full-scale research on not just silicon device structures but also piezoelectric devices structures including Lead Zirconate Titanate (PZT).

Magnetic Resonance Force Microscopy (MRFM)

This system enables nondestructive analysis of semiconductor and biological materials and devices using magnetic resonance imaging at the micrometer to nanometer length scale. MRFM has a single-atom sensitivity, which enables imaging of single molecules. Applications will be to assist nanoelectronic device design and fabrication by studying such things as internal electric fields, material interfaces, and electron spin transport. This ability is unique. The MRFM technique has been demonstrated on GaAs and no one else in the world is applying MRFM to study semiconductors.

Image Processing/Target Recognition and Signature Modeling Facility

This facility has a unique configuration of computer facilities, imagery data and image-processing software with which to develop new target detection and recognition algorithms, principally for EO/IR sensors. The research in this laboratory is focused on initiating and developing new algorithmic approaches for Army EO/IR sensors for automatic and aided target recognition, which includes the detection and classification problems. Dedicated resources include RAID storage for extensive databases of imagery and associated ground targets. The lab also has several visible and IR imagers for use in collecting specialized imagery for algorithm development.

Microwave/Millimeter-Wave Anechoic Chamber

This facility is used for measuring directivity patterns and gain on antenna elements and aperture arrays. This facility is also used for radar cross section (RCS) signature measurements on targets of interest. A steel platform outside the tapered end allows for experiments using external equipment and includes a positioner mounted on a rail translator for insertion into the aperture.

Electric Field Cage

The Electric-Field "cage" is a unique ARL facility for generating DC and low frequency AC fields for sensor design, calibration, and evaluation. It is roughly analogous to an anechoic chamber for acoustic or radar measurements, or a Helmholtz coil system for quasi-static magnetic field measurements, in that it attenuates unwanted external fields and generates calibration-quality fields for testing in a laboratory environment. The E-field cage is essentially a large parallel-plate capacitor with "guard rings" to control fringing fields; however, the size of the cage and the spacing of the guard rings can be modified to accommodate the needs of individual tests. The cage can be run in a "single-ended" mode for testing ground-based or aircraft-based sensors, or in a "double-sided" mode for testing projectile-based and other free-space sensors.

Electromagnetics Research Facility (EMRF)

This unique Army research facility consists of a sand box simulating terrestrial environments in an enclosed RF transparent building. The dielectic constraints of the sand (sigma and mu) are adjusted by moisture content and control. Special soils may be substituted. Climate controlled laboratory space directly underneath the sandbox permits high-fidelity, high-frequency RF measurements. This facility is useful for wideband antenna design, scale model EMP measurements, ground-penetrating radar evaluations, etc.

Magnetics Research Facility (MRF)

The magnetic test facility has three Helmholtz coils that can generate magnetic fields in three perpendicular directions to balance the earth's magnetic field. There is an additional set of Helmhotz coils that can generate larger fields, 140 Oe. A measurement stage with non-magnetic microprobes can be positioned in the center of the coils. A set of coaxial Mumetal magnetic cylinders can be used for low-field measurements.

Mobility/Portability Research Facility

Army standard for measuring the effects of various equipment configurations and loads on Soldier mobility and physiological performance. This set of instrumented courses includes a cross-country course that simulates a movement-to-contact event and an obstacle course that simulates an assault event with obstacles that represent natural and urban battlefield features.

Electrochemical Facility

This unique Army research facility includes a dry room equipped for prototyping thermal and liquid reserve batteries. A second dry room, maintained at below 1 percent relative humidity, is used for prototyping high-energy and high-power, experimental batteries. Also included are inert atmosphere chambers, a spin/setback "air gun" for realistic laboratory testing of reserve munition batteries, chemical synthesis equipment and analytic equipment for fabricating and evaluating highly energetic anodes, cathodes and electrolyte materials and components for batteries, capacitors and fuel cells.

Display Materials Research Facility

This facility is for research and development of the materials, structures and devices which will be the basis for the displays and display systems which the Army will need for our soldiers to effectively display and assimilate data on the digital battlefield. Capabilities include luminescent research, device structures fabrication and deposition of thin-film electroluminescent materials and organic light-emitting devices.

Ultra Wideband (UWB) Synthetic-Aperture Radar (SAR) Testbed

A mobile UWB SAR testbed, featuring a 150-foot measurement system, is used to support vehicle-mounted, ground-penetrating radar developments, including mine detection systems. The UWB radar on a 150-foot boom lift allows for collection of two-dimensional apertures to support three-dimensional image formation for improved target detection and identification.

Transonic Experimental Research Facility

This unique experimental facility has the following capabilities: evaluates aerodynamics and fluid dynamics of projectiles, smart munitions systems and sub-munitions dispense systems, determines input for artillery fire-control computers and firing tables, evaluates advanced conventional gun propulsion technologies; determines experimental direct fire accuracy, evaluates advanced munitions designs; and analyzes the structural dynamics of gun and ammunition systems from 60mm to 208mm.

Cannon-Caliber Electromagnetic Launcher Facility

This facility features an installation that measures the launch and flight performance of electromagnetic cannons up to 30-mm in diameter. Equipped with a two-mega Joule power supply and a range of 250 meters, it allows diagnostics of electrical, mechanical and aerodynamic qualities of electromagnetic gun systems.

Large-Caliber Terminal Ballistics Facility

The Large-Caliber Terminal Ballistics Facility, unique in the U.S., is capable of routinely conducting full-scale terminal ballistic experiments with both kinetic-energy projectiles and explosive warheads against both passive and reactive armors. It features an environmentally contained impact chamber that can handle high-explosive warheads and targets, depleted-uranium projectiles, warheads, and targets and full-scale combat systems or subsystems.

Enclosed Small and Medium Caliber Firing Experimental Facility

This facility provides the capability to conduct completely instrumented terminal ballistics experimental tests with small and medium-caliber tungsten alloy penetrators against advanced armor threats.

Shaped-Charge Research and Shear-Forming Press Facility

This is a fully instrumented outdoor facility that allows investigation of shaped-charge warheads. It features high-energy, X-ray radiography that provides detailed information on shaped-charge jet break-up and particulation during terminal effects experiments. The facility can also simulate rotating warheads in spin-stabilized projectiles. The Shear-Forming Press allows rapid fabrication of liners for shaped-charge and EFP warheads.

EFP Terminal Effects Research Facility

This facility is a fully instrumented experimentation complex used to investigate terminal ballistic effects of explosively formed penetrator warheads, or EFPs. It features high-energy x-ray instrumentation that provides detailed information on the acceleration and deformation of EFP liners to form penetrators.

Aerodynamics Experimental Research Facility

Provides aerodynamic testing and fluid dynamics of smart munitions systems and sub-munitions dispense systems; experimental direct fire accuracy and advanced munitions design; and structural dynamics of gun and ammunition systems from 2mm to 40mm.

High-Rate Mechanical Characterization Facility

The High-Rate Mechanical Characterization Facility is unique because it measures response to deformation of energetic materials under operational conditions. Uniaxial compression and tensile measurements are made to predict mechanical behavior in material and structural models, assess the mechanical response of new gun and rocket propellants, explosives and other munitions and evaluate the vulnerability response of these materials to impact threats.

Vertical Impulse Measurement Facility (VIMF)

The VIMF is a unique DoD facility for measuring accurately the combined debris and blast impulse produced in landmine detonations in a semi-infinite medium, including parameters such as soil type (sand, clay, loam, gravel, and mixed), moisture content, temperature, particle-size distribution, density and compaction (stiffness and modulus); depth of burial or mine; mine type; in both road and open-field conditions. Data are used to validate models and develop technologies for improved survivability of future lightweight tactical and combat vehicles.

Composites Processing Research Facilities

Advanced low-cost, reliable processing techniques are essential to the future application of structural polymer matrix composites to Army ground vehicles, aircraft and other materiel. ARL's state-of-the-art composites processing research facilities, such as the fully-automated, high-temperature (800 degrees Fahrenheit) and pressure (450-psi) autoclaves, provide the necessary research tools to address scientific and engineering problems in process optimization and automated process control.

Materials Characterization Facility

This facility enables ARL to conduct detailed measurements of the properties of ceramics, polymers, glasses and composites. It features instrumentation for analyzing the chemical properties of materials at a wide range of temperatures, optical and electron microscopy and electron probe instruments for microstructural analysis, x-ray residual stress analysis and electrical, magnetic and thermal property characterization and a combination of surface analysis equipment.

Target Assembly Facility

This facility provides the capability of integrating new armor concepts into actual armored vehicles. Featuring the capability of machining and cutting radioactive materials, it provides a means of fabricating and analyzing depleted-uranium armors and armors impacted by depleted-uranium projectiles.

Armor Experimental Facility

This facility is a fully-instrumented experimentation complex used to develop and evaluate armor technology to defeat Explosively Formed Penetrators (EFP's) and Shaped Charges. It features high-energy X-ray instrumentation that provides detailed information on the acceleration and deformation of EFP liners to form penetrators.

Munitions Survivability Facility

This experimental complex is used to investigate the survivability of ammunition compartments vs. chemical-energy munitions and conduct other large-scale explosive experiments. It contains ballistic pendulum used to investigate the response of gun propellant to kinetic-energy and chemical-energy munitions and sympathetic detonation of gun propellant.

Large and Small-Caliber Armor Research Facility

This facility is an environmentally-contained outdoor complex that hosts complete diagnostics to analyze the performance of classified armor technologies against kinetic-energy penetrators, including depleted-uranium armors and munitions.

Nanobiotechnology Facility

This facility holds world-class characterization equipment. The focus is to produce nanobiotechnology for agent detection, defense, and neutralization; individual combatant protection; and novel survivability concepts.

Dismounted Infantry Survivability and Lethality Testbed (DISALT)

This system projects a simulated environment on a screen using an image-generated computer. A high-speed weapon tracking system provides real-time continuous weapon aim point data to the weapon computer subsystem while the simulated shooting scenario is running. Recoil is simulated using an electromechanical recoil subsystem and digitized sound data.

Acoustic Anechoic Chamber

A full acoustic anechoic chamber allows the study of transducers, sensors, speakers, signal processors and other microphone systems. Acoustic/infrasonic microphones, with a flat bandwidth down to a true zero hertz (DC), can be evaluated to determine their sensitivity in reference to calibrated, laboratory grade COTS transducers.

Shooter Performance Research Facility

Outdoor, computerized, state-of-the-art facility for examining Soldier-weapon performance. Targets can be presented at any distance, time interval, target exposure time and target sequence.

Environment for Auditory Research (EAR) Facility

As a current infrastructure upgrade project, this facility is intended as a localization, spatial orientation and distance estimation research center permitting state-of-the-art creation and simulation of various indoor and outdoor acoustic environments.

Cognitive Assessment, Simulation and Engineering Laboratory (CASEL)

As a current infrastructure upgrade project, this facility will lead directly to an increased understanding of individual and team performance and enhanced computer interfaces and tools that improve Soldiers' cognitive readiness and knowledge management in stressful, militarily relevant conditions. Initiated in late FY05 as part of a three phase plan, final purchases of laboratory equipment are scheduled for FY07.

Novel Energetic Research Facility (NERF)

The NERF is an Energetic Materials Development Facility. The NERF contains a processing complex with energetics processing and manufacturing labs. Additionally, there is a formulation complex with energetics formulation and energetics properties labs. Examples of mission successes attributed to the NERF include new Army Insensitive Munitions (IM) Energetics.

Intelligent Optics Laboratory

This laboratory is equipped to support sophisticated investigations in adaptive and nonlinear optics, advanced imaging and image processing and laser communications for ground-to-ground applications. A variety of state-of-the-art adaptive optics, wavefront diagnostics and image processing tools are used to support advanced techniques for simulation of atmospheric turbulence effects on imaging and laser communication system performance.

Experimental Facility 6 (EF6)

This modern, centralized complex provides analysts, program managers, and decision makers with experimental data that addresses the SLV of air and ground combat systems. Experimental programs are conducted on U.S. and foreign weapon systems and can range from simple single component experimentation to extensive full-up system level test. Emphasis is placed on system design for vulnerability reduction and the development of SLV model improvements.

Small Arms Experimental Facility 20

The Peep Site, EF20, is an indoor, small-arms range rated to handle firings of threats.

Electro-Optical (EO) Countermeasures Missile Flight Simulator

This facility is a hardware-in-the-loop real-time simulator. The simulator consists of both analog and digital computer systems supplemented by special scene generation hardware and software capable of providing a complex EW environment consisting of decoy flares, EO-jammers, advanced countermeasures devices, and complex backgrounds.

Electro-Optical Vulnerability Analysis Facility (EOVAF)

The EOVAF possesses theoretical, laboratory, and field capabilities for performing optical cross section (OA), laser jamming and damage and optical performance characterizations of optical/electro-optical (O/EO) devices used by weapons systems. Laboratory analyses are performed in the visible, near-IR, mid-IR, and far-IR regions. The EOVAF includes instrumented laser range and mobile equipment for performing maximum optical detection range and laser-jamming susceptibility measurements.

Information Operations Facility

This facility is designed to support ARL Information Operations (IO) Vulnerability/Survivability Assessments of Information Technology (IT) components in US Army item level and weapon systems platforms. Laboratory investigations are conducted on systems to identify IO susceptibilities and/or vulnerabilities. The facility can also be configured to support several different network topologies and configurations with CISCO routers, switches and hubs.

Air Defense Electronic Warfare Facility

This facility provides a quick-reaction capability for the implementation of electronic warfare (EW) techniques to ensure that all elements of the EW threat required for the vulnerability assessment process are addressed. The facility provides a wide variety of R&D ECM devices that support all air defense EW vulnerability investigations and supports a wide variety of special-purpose equipment.

Test Environmental Certification Complex (TECC)

The TECC is a computer-controlled receiving and analysis facility associated with air defense systems. The TECC consists of a narrow beam steerable antenna system, multiple RF receivers, and hardware and software analysis systems.

Field Mobile Management System (FMMS)

The FMMS is a computer-controlled, special-purpose measurement system that supports EW vulnerability analyses by independently measuring, recording, and certifying EW environments. It can measure frequency, amplitude, pulse widths, and modulation parameters of various jamming waveforms.

Electronic Warfare Signature Measurement Facility

This facility contains specialized mobile spectral, radiometric and imaging measurement systems to characterize ultraviolet, visual and near IR, mid-IR, and far-IR static and dynamic targets and EW countermeasures in the backgrounds in which they operate. This facility provides measured EW environments for weapons field experiments. Results are used in EW simulations and signature modeling validation and EW analysis.

Major Shared Resource Center (MSRC)

ARL hosts one of four DoD MSRCs for HPC. This MSRC facility features state-of-the-art scalable parallel architectures and large vector-parallel systems supporting both classified/unclassified missions throughout the DoD's RDT&E community. The MSRC is critical for tech base research, enables optimized design/development/testing and minimizes life cycle acquisition costs. ARL is ranked in the top five percent of the world's most powerful computing sites.

ARL's Scientific Visualization Laboratory Facility (including Multimedia Laboratory)

This facility features state-of-the-art visualization computational hardware with high-speed HPC connectivity including three unique visualization technologies: the Immersadesk displays real-time stereographic views; the Phantom Haptic Input Device enables users to understand the shape/forces within their data through their sense of touch. The Vision Dome provides users a full field of view for the unique experience of traveling through data sets.

Information Assurance (IA) Facility

The Facility acts as a fusion point for bridging ARL's research in tactical and operational IA areas, and the development/assessment of improvements to monitoring/analysis processes, including new monitoring tools/testbeds. The Facility is equipped with incident databases to capture the information and analysis databases to provide the forensics on the intrusion. In addition, the facility maintains an off-line disk/tape storage library.

Visualization Augmentation Laboratory for User Experiments (VALUE) Facility

The Facility is a software integration and demonstration laboratory that combines a unique blend of integration software technologies, visualization display modalities, infrastructure for collaboration among users and tools for conducting experiments. The facility hosts a network of hardware and software that provides the foundation to accept/integrate a wide variety of software technologies to evaluate new concepts in battlefield information processing.

Aerosol Laser Facility

This Facility is used to develop methods for the detection/characterization of atmospheric aerosols, dust, haze and other battlefield obscurants. It combines the capability to generate, concentrate and dilute aerosols through the use of scientific instrumentation designed to enhance this process. By using Nephelometers and Aerosol Particle Sizing equipment, elastic scattering can be measured and the absorption rates determined.

Acoustic/Electro-Optics Propagation Range Site (AEOPRS) - Blossom Point, MD

The AEOPRS provides a pair of ranges to conduct experiments on the environmental effects on acoustic/EO propagation. The ranges can be instrumented to measure the atmospheric conditions/signals propagated through the complex environment: in particular, a littoral regime. The AEOPRS provides the ability to collect detailed meteorological/acoustic/EO data for the development of state-of-the-art models and the evaluation of current acoustic/EO models.

Mobile Acoustic Source (MOAS)

MOAS is a system with environmental capabilities that exist in no other system in the world. It is a pneumatic loudspeaker system that allows scientists to verify acoustic models of atmospheric effects. The system is a true exponential horn. It generates sound sufficient for testing acoustic propagation of sources.

Environmental Sensing and Optical Spectroscopy Research Facility

This facility is used to devise optical methodologies for the detection of chemical/biological hazards and for laser spectroscopy research. Equipment capability spans the UV into the infrared to include a titanium sapphire laser with wavelength doubling and tripling capabilities and a unique optical parametic oscillator-based laser system which can simultaneously produce "laser" emissions. Optical spectroscopy done includes UV, visible and NIR absorption, enhanced Raman Spectroscopy, luminescence and fluorescence spectroscopy and photothermal interferometry.

Explosive Detonation Simulator

Acoustic impulses can be produced with a prescribed amplitude and shape that simulates the blast wave on the ground. Adjustable chamber properties control the acoustic impulse amplitude and wave shape. Other impulses can be simulated. This high amplitude impulse capability can reproduce the capacity of a series of high amplitude acoustic detectors requiring an acoustic impulse source in excess of the sound pressure levels produced by available speakers.

Ballistic Pendulum Facility

This facility is an outdoor experimental facility that is used to investigate the response of gun propellant to KE and CE munitions and sympathetic detonation of gun propellant. This facility features a unique combination of equipment, including cinematographic radiography that provides a capability of detonating up to 100 pounds of explosive for a single experiment.

Ion Implantation Facility

Novel ion surface treatments and coating techniques for Army material such as machine tools and parts subject to corrosive or high-wear environments are devised and proven out at this facility. This technology provides significant improvements in the quality of protective coating techniques, such as cadmium and chromium plating. This ion-implantation process has proven to be environmentally acceptable compared to cadmium, chromium and other heavy metal plating processes, which collectively account for 90 percent of the hazardous wastes generated by all electroplating processes within DoD.

Electro-Optical Data Acquisition and Tracking System (EDATS)

The EDATS dynamically tracks and measures target signatures. It consists of an instrumentation van integrated with an automated tracking pedestal capable of controlling the operation of six electro-optical (EO) missile seekers in a captive track arrangement. The EDATS is equipped with IR through UV spectrometers, radiometers, and images to obtain signatures of targets, CM and backgrounds. Automatic target tracking is achieved with highly modified Chaparral AN/DAW-1B missile seeker or with digital and analog outputs from the control computer.

Acoustic/Seismic Countermeasure Vehicle

A modified stake-bed truck evaluates acoustic and seismic CM by functioning as an acoustic or seismic decoy and an acoustic jammer. An acoustic loudspeaker system, consisting of a 12-kilowatt power generator, subwoofer cabinets and power amplifiers can reproduce any signal within a frequency range of 40 to 200 Hz. A towed tank sprocket generates seismic energy simulating ground combat vehicles. A prerecorded target signature is radiated to simulate a moving ground vehicle target. To simulate an acoustic jammer, it radiates broadband noise to hide target vehicle acoustic signatures.

Open-Loop Tracking Complex (OLTC)

The OLTC explores electro-optical (EO) missile system responses to countermeasures environments using simulation scene techniques. The OLTC consists of an automated rate table with scene generation equipment that provides radiation from three broad band xenon arc lamps, target and decoy black bodies, and an HG/DF chemical laser. Signal conditioning, signal recording, and data logging equipment augment data collection. Simulation studies to ascertain design weaknesses of an EO missile system design are conducted using an actual missile seeker or a breadboard electronic model of the seeker.

Mobile Atmospherics Effects Instrumentation

A full suite of mobile instrumentation is used for the characterization of atmospheric effects and obscurants on EO systems. Information gained from the instrumentation is used in the analysis of optical performance characteristics and the vulnerability analysis of EO weapon systems operating in environments degraded by rain, snow, fog, dust, etc. and/or disseminated smoke obscurants. The capabilities that cover the visible, near-IR, far-IR and MMVV consist of sharing and imaging transmittance, particle size and distribution, Lidar, cloud growth and dynamics and unique meteorology.

Profiler Testbed

Profiler is the only mobile system in the world today that combines a real-time remote sounding capability with a near-real-time mesoscale model for analysis and forecasts over domains, all contained in a HMMWV shelter with trailer for the wind radar. Remote sensors include the wind radar, a passive microwave, a radiometer for temperature profiles (plus total water vapor and total liquid water) and a meteorological multiple satellite receiver. A local combined sounding can be produced as often as every five minutes.

Directed Energy Anechoic Chamber

This unique Army research facility consists of power anechoic chamber and one transverse electromagnetic cell for characterizing RF response of electronics to High Power Microwaves (HPM). Externally modulated high-power amplifiers and adapted radar sources provide CW and pulse modulated waveforms. Power levels vary and are supported in bands of common interest.

Advanced Microanalysis Facility

This facility provides the Army and DoD with a fully integrated capability for chemical and structural analysis of electronic materials and devices. Characterization measurements reach resolution on the atomic scale and elemental detection sensitivities to parts-per-billion levels. The facility contains surface and bulk characterization instrumentation. An additional function is failure analysis of failed critical military devices or systems.

Light Gas Gun Facility

This facility is used for sub-scale ballistic evaluations of the penetration mechanisms associated with various materials. It features 1-MeV flash X-ray radiography, high-speed photography, and laser interferometry, which provide detailed information on target-penetrator interactions. Many of the experiments are conducted using the "reverse ballistics" approach where a target is launched into a penetrator.

Partnership

The Army Research Laboratory (ARL) is partnering and collaborating with academia, industry and other government organizations through a variety of continuing and new innovative programs. Our intent is to maximize the use of our limited research dollars by leveraging the resource investments of our partners using a variety of approaches among which are contracts, grants, cooperative agreements, Cooperative Research and Development Agreements (CRDAs), etc. Our interactions can be with individual organizations or with multiple organizations across the S&T community.

Extramural Research

ARL has a strong linkage to the academic community through the Single Investigator Program, the Multidisciplinary University Research Initiative (MURI) Program, and University Affiliated Research Centers (UARCs). In FY06, ARL anticipates an extramural basic research program with over 900 Single Investigator and 60 MURI grants and contracts to over 275 academic partners in almost all 50 states. This extramural research seeks to discover and exploit new scientific opportunities and technology breakthroughs in the physical sciences (physics, chemistry, life sciences), the engineering sciences (mechanical, electrical, materials, environmental) and mathematics and information sciences (mathematics, computing and informational sciences). ARL will continue to work closely with its three University Affiliated Research Centers (UARCs) partners addressing basic research in Nanotechnology, Biotechnology, and Electromagnetics/Hypervelocity Physics and its four Centers of Excellence (COEs) in Materials, Microelectronics, Flexible Displays, and Army High Performance Computing Research Center (AHPCRC).

Collaborative Technology Alliances (CTAs)

ARL has five Collaborative Technology Alliances (CTAs) in the areas of Advanced Sensors, Advanced Decision Architectures, Communications and Networks, Power and Energy, and Robotics. The CTAs involve partnerships between industry (lead), academia, small business, HBCU/MIs, and ARL and leverage the large investments being made by the commercial sector in basic research areas of interest to the Army.

Small Business Innovative Research (SBIR)

ARL works with the small business community through the Small Business Innovative Research (SBIR) program. The SBIR programs provides small business an opportunity to provide high-quality research of innovative concepts to solve Army/Department of Defense (DoD) related scientific or engineering problems, especially those concepts that also show high potential for commercial use. ARL will award over 100 contracts for Phase I, Phase II, or Phase II plus efforts in FY06.

Cooperative Research and Development Agreements (CRDA)

ARL has over 40 active CRDAs with industry in FY06. CRDAs are formal agreements under which one or more Federal Laboratories and one or more non-Federal partners such as, business, industry, academia, state or local government, or foundations agree to work on a research or development project of mutual interest with a predetermined duration. All parties may contribute personnel, services, facilities, equipment, and other property to this joint effort. However, only the non-Federal entities are allowed to contribute funding.

Test Service Agreements (TSA)

ARL maintains world class facilities, recognized by our industry partners, where they are willing to pay ARL for their use. A Test Service Agreement (TSA) is a technology transfer mechanism that enables Federal Laboratories to perform work for hire. Title 10 U.S. Code 2539b authorizes Federal Laboratory directors and commanders to make testing services available to private industry. ARL's use of test service agreements have grown over the last few years from approximately 24 TSAs and $0.8 million in FY03 to 40 TSAs and $4.2 million in FY05. In FY06, we anticipate continued growth of TSA support.

International Collaboration

ARL is working with international partners through 23 bilateral arrangements such as Data/Information Exchange Annexes in materials, with the United Kingdom and Republic of Korea, ballistics with Germany, UK and France, and sensors with Sweden, Germany and UK, and Project Agreements, such as acoustics with Israel and EM gun with UK. ARL also works with international partners multi-laterally through membership in The Technical Cooperation Program (TTCP) Action Groups in sensors, weapons, materials, human resources and performance, etc. In addition, ARL works closely with the RDECOM managed U. S. Army International Technology Centers to identify emerging technologies from foreign S&T sources for application to Army materiel requirements.

Network and Information Systems (ITA)

ARL is spearheading an innovative approach to international cooperative research and development through creation of an International Technology Alliance (ITA) with the United Kingdom Ministry of Defense (MOD). Under the ITA, the US and UK will establish a jointly funded and managed consortium of industry and university partners to conduct fundamental research in the area of Network and Information Sciences. The objective of the ITA is to exploit the synergistic combination of four important technical areas (Network Theory, Security Across a System of Systems, Sensor Information Processing and Delivery and Distributed Coalition Planning and Decision Making). This will support the full spectrum of missions required of today's military forces including humanitarian support, peacekeeping and full combat operations in any kind of terrain, but especially in complex and urban terrain.

Capabilities at a Glance

Ground Vehicle Research Facility

Tactical Environmental Simulation Facility (TESF)

Advanced Material Growth and Processing Facility

Specialty Electronic Materials Devices Class 100 & Class 10 Cleanroom Research Facility

High-Temperature Power Electronics Facility

Nonlinear Materials Characterization Facility

Power Conditioning Research Facility

Millimeter-Wave Instrumentation Test Facility

Microelectromechanical Systems (MEMS) Research Facility

Magnetic Resonance Force Microscopy (MRFM)

Image Processing/Target Recognition and Signature Modeling Facility

Microwave/Millimeter-Wave Anechoic Chamber

Signature Research Facility

Electric Field Cage

Electromagnetics Research Facility (EMRF)

Magnetics Research Facility (MRF)

Mobility/Portability Research Facility

Electrochemical Facility

Display Materials Research Facility

Ultra Wideband (UWB) Synthetic-Aperture Radar (SAR) Testbed

Transonic Experimental Research Facility

Cannon-Caliber Electromagnetic Launcher Facility

Large-Caliber Terminal Ballistics Facility

Enclosed Small and Medium-Caliber Firing Experimental Facility

Shaped-Charge Research and Shear-Forming Press Facility

EFP Terminal Effects Research Facility

Aerodynamics Experimental Research Facility

High-Rate Mechanical Characterization Facility

High-G Gun Launch Simulation Facility

Vertical Impulse Measurement Facility (VIMF)

Composites Processing Research Facilities

Materials Characterization Facility

Target Assembly Facility

Armor Experimental Facility

Munitions Survivability Facility

Large and Small-Caliber Armor Research Facility

Nanobiotechnology Facility

Dismounted Infantry Survivability and Lethality Testbed (DISALT)

Acoustic Anechoic Chamber

Shooter Performance Research Facility

Environment for Auditory Research (EAR) facility

Cognitive Assessment, Simulation, and Engineering Laboratory (CASEL)

Novel Energetic Research Facility (NERF)

Intelligent Optics Laboratory

Experimental Facility 6 (EF6)

Small Arms Experimental Facility 20

Electro-Optical (EO) Countermeasures Missile Flight Simulator

Electro-Optical Vulnerability Analysis Facility (EOVAF)

Information Operations Facility

Air Defense Electronic Warfare Facility

Test Environmental Certification Complex (TECC)

Field Mobile Management System (FMMS)

Electronic Warfare Signature Measurement Facility

Major Shared Resource Center (MSRC)

ARL's Scientific Visualization Laboratory Facility (including Multimedia Laboratory)

Information Assurance (IA) Facility

Visualization Augmentation Laboratory for User Experiments (VALUE) Facility

Aerosol Laser Facility

Acoustic/Electro-Optics Propagation Range Site (AEOPRS) - Blossom Point, MD

Mobile Acoustic Source (MOAS)

Environmental Sensing and Optical Spectroscopy Research Facility

Explosive Detonation Simulator

Ballistic Pendulum Facility

Ion Implantation Facility

Electro-Optical Data Acquisition and Tracking System (EDATS)

Acoustic/Seismic Countermeasure Vehicle

Open-Loop Tracking Complex (OLTC)

Mobile Atmospherics Effects Instrumentation

Profiler Testbed

Directed Energy Anechoic Chamber

Advanced Microanalysis Facility

Light Gas Gun Facility

RDECOM

Communications-Electronics Research, Development and Engineering Center (CERDEC)

CERDEC

US ARMY – RDECOM

Communications-Electronics Research, Development and Engineering Center (CERDEC)

FT. Monmouth, NJ 07703-5209

Mission

To develop and integrate Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance (C4ISR) Technologies that enable Information Dominance and Decisive Lethality for the Networked Warfighter.

History

The Communications-Electronics Research, Development and Engineering Center (CERDEC) originally was part of the Army Materiel Command's (AMC) subordinate Communications-Electronics Command (CECOM), headquartered and primarily located at Fort Monmouth, NJ. In 2002, the Research, Development and Engineering Command (RDECOM) was established under the direction of AMC Commander General Paul J. Kern and stood up on October 1, 2002. The mission of this new command was to develop and mature technologies that sustained America's Army as the premier land force in the world. To accomplish that mission, operational control of the R&D activities of AMC's Major Subordinate Commands were transferred to RDECOM. This included the CECOM RD&E Center (CECOM RDEC), which was renamed the CERDEC. Additionally, portions of the CECOM Logistics and Readiness Center (sustainment engineering) and the CECOM Software Engineering Center (software engineering) transferred to RDECOM / CERDEC. Today, the CERDEC is the Army's information technologies and integrated systems R&D center. The Command and Control Directorate, Intelligence and Information Warfare Directorate, Night Vision and Electronic Sensors Directorate and Space and Terrestrial Communications Directorate work together to develop and integrate command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) technologies that enable information dominance and decisive lethality for the networked Warfighter.

Installation Overview

The majority of the CERDEC's facilities are distributed across Fort Monmouth, NJ. CERDEC Headquarters and most of the CERDEC's personnel are located in the Myer Center in the Camp Charles Wood area. Southwest of Fort Monmouth, the CERDEC Flight Activity utilizes a hanger at nearby Naval Air Engineering Station, Lakehurst, NJ. Additionally, test ranges and a total of five buildings are used at Fort Dix, NJ to conduct C4ISR on-the-move experimentation.

CERDEC's Night Vision and Electronic Sensors Directorate (NVESD) along with portions of the Command and Control Directorate and Product Realization Directorate reside on a portion of Fort Belvoir, VA. that includes 25 buildings. The NVESD also has a range facility at Fort A.P. Hill, VA.

Contact Information

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Capabilities

CERDEC Headquarters (CERDEC HQ)

The CERDEC Government Integration Center (GIC)

The CERDEC Government Integration Center (GIC) provides a centralized, fully equipped, flexible C4ISR engineering test bed to examine and evaluate the capabilities of emerging C4ISR technologies in a System of Systems environment. The GIC capabilities include a modeling and simulation environment, a full suite of Legacy ABCS Systems, worldwide connectivity, as well as personnel skilled in the various disciplines required to maintain the systems and infrastructure. Communications include connectivity to Fort Dix NJ, DREN, SDREN, SIPRNET, Boeing LabNet, CERDEC directorates, and Battle Labs as well as the capability to reach virtually anywhere in the world. The GIC is currently being used to support the integration and test of FCS C4ISR systems for the on-the-move demonstrations.

Command and Control Directorate (C2D)

The C2D develops, applies, integrates and demonstrates advanced command and control systems and related enabling technologies, including generation of advanced command and control systems and architectural concepts; integration of battle command intelligence and logistics databases; C4I modeling/simulation; prototype development; and development of battlefield visualization, decision aid, collaboration, navigation, power generation and environmental control technologies.

C2D Power Source Research, Development, Test, and Evaluation Laboratory – Fort Monmouth, NJ

This laboratory consists of uniquely integrated facilities used for the research, development and testing of all military portable power sources. The facilities are also used to validate and test new prototype sources from Army, DOD, other government agencies and commercial laboratories.

C2D Test and Evaluation Laboratory – Fort Monmouth, NJ

This laboratory contains environmentally controlled systems and electrochemical test equipments for evaluating the electrochemical performance, safety and physical characteristics of power sources including batteries, chargers, solar panels, fuel cells and Stirling engines. The facility is networked with other DoD and government R&D activities, commercial vendors and academia and is unique in its design to test power sources over the full environmental operational range from desert to arctic conditions. The facility supports OEF/OIF by validating production battery requirements in desert environmental conditions.

C2D Power Source Research and Development Laboratory – Fort Monmouth, NJ

This laboratory contains specialized electrochemical material and test equipments, including a custom one percent relative humidity dry room which houses the battery pilot line fabrication facility for building prototype military batteries to unique requirements. This laboratory develops high-energy, reliable, cost effective advanced battery and portable power solutions for the Soldier. The laboratory is used to test commercial technology and novel electrochemical systems and to evaluate their use for improvement of Army power solutions. The laboratory has the ability to test prototype power sources against simulated operational equipment duty cycles and to perform failure and postmortem analysis of prototype and production cells and batteries.

C2D Power Generation Laboratory – Fort Belvoir, VA

This laboratory is primarily used to design, fabricate and develop JP-8 fuel burning power systems. It is geared to conduct power quality testing to MIL-STD-705 and performance, endurance and fuel consumption testing of power components and systems. It also provides for environmental testing of engines, generators, fuel cells and environmental control units weighing up to 5,000 pounds.

C2D Environmental Control Development/Test Laboratory – Fort Belvoir, VA

This facility is used to develop, test and evaluate environmental control systems and the Standardized Integrated Command Post air conditioner.

C2D Fuel Cell Technology Laboratory – Fort Belvoir, VA

This laboratory serves as a test and evaluation center for both low-power (0-500W) and mid-power (500W-5000W) fuel cell systems.

C2D Environmental Test Facility – Fort Monmouth, NJ

This facility is used to simulate many of the harsh environments that military equipments must withstand. The facility is capable of performing MIL-STD 810 Environmental Testing in order to simulate the induced environments of vibration, shock, explosion, as well as climatic environments such as extreme temperature, humidity, combined environmental reliability testing, salt, fog, altitude, rain, wind and immersion as encountered in ground and airborne platforms. Cable flex, battery violent vent, and tension/compression testing also can be performed.

C2D Fabrication Facility - Fort Monmouth, NJ

This facility houses specialty shops that provide Computer Numerical Controlled (CNC) precision sheet metal work, welding operations, and conventional and CNC controlled machining operations, all in connection with the fabrication, assembly and installation of developmental and prototype assemblies for C4ISR systems integration programs.

C2D Systems Engineering Integration Laboratory - Fort Monmouth, NJ

This laboratory provides an environment for the bench top integration of mission equipment suites. This laboratory integration allows for the configuration, testing and experimentation of the system components and interconnections while changes can be easily made prior to the integration of the mission equipment into the shelters or vehicles.

C2D Integration Facility - Fort. Monmouth, NJ

This facility provides quick reaction systems integration capabilities, from unique prototype and experimental systems to limited run integration of fully-released tactical C4ISR shelter systems. Available facilities include: fully configured integration bays including power hookups for burn in and operational test of shelter/vehicle systems; storage rooms and cages for secure stowage of specialized test equipment as well as equipment awaiting installation; crane equipment for installation of military shelters onto vehicles; and classroom space for training on newly installed equipment and complete C4ISR shelter/vehicle systems. The electrical integration section provides shop space and workbenches for the fabrication, assembly, integration, troubleshooting and testing of cable assemblies, electro-mechanical subassemblies and C4ISR systems. This area also includes a paint shop and a small carpentry shop that provides a woodworking capability in order to fabricate, among other things, shelter system work surfaces and custom shipping containers.

C2D Inventory Control, Parts and Materiel Handling Facility – Fort Monmouth, NJ

This facility provides computer-based project inventory control in support of the C4ISR systems integration programs. This facility serves as the central area for shipping/receiving and controlling of purchased parts, in-house fabricated parts being staged for pending shipment to the subcontractor for chemical conversion and/or Chemical Agent Resistant Coating painting, returned parts from finishing operations and inventory control for all parts awaiting platform integration at the integration facility. Additionally, it provides a means for the shipment preparation for the final products to customers and/or end users.

C2D Virtual Prototyping Laboratory - Fort Monmouth, NJ

This laboratory houses a PC-based, immersive 3-D technology for engineering design staff and customers to make better-informed C4ISR equipment layout decisions prior to the physical build. This virtual reality system provides an interactive environment that assists in the design review before fabrication and physical prototyping is started and allows customers to determine, generate and document system requirements for future and notional C4ISR systems. Virtual reality is also being considered for training, where the maintainer and system integrator can learn the system through the immersive 3-D models long before the physical prototype is available.

C2D Improved Data Modem (IDM) Laboratory - Fort Monmouth, NJ

This facility consists of a laboratory to support PM Aviation Mission Equipment (AME) on all test issues related to the IDM such as: integration testing of current IDM hardware/software releases, rapid response testing on platform developer integration issues, design/fabrication of Ground Test Sets and Mini Test Sets for platform integrators and maintenance and support of test sets and the design/fabrication of special purpose cabling to support platform integrators and PM AME.

C2D High-Frequency (HF) Tracker Laboratory - Fort Monmouth, NJ

This laboratory provides for software development, maintenance, testing and training of the HF Tracker program. The HF Tracker system is a beyond line of sight flight-following system that integrates airborne HF radios into the tactical internet while also providing an end-user command and control capability to non-digital units. The system is currently fielded to OIF and OEF units by PM Aviation Mission Equipment. The laboratory consists of an HF radio network, tactical computer systems, and a commercial software development environment. It is used by C2D software developers, ARL human factors personnel, Software Engineering Directorate trainers, Logistics Readiness Center testers and PM AME support contractors.

C2D Simulation and C2 information Systems Connectivity Experiments (SINCE) Laboratory - Fort Monmouth, NJ

This laboratory is used to develop decision-support technologies and prototype applications for commanders and staff. These technologies and prototypes range in maturity from Technology Readiness Level (TRL) two to five. They are integrated with more mature software to include COTS and GOTS for tests, operational experiments and evaluations to determine how well they perform on the battlefield and meet the commander's information needs. The laboratory is also used for tests and demonstrations with industry and coalition partners. The laboratory is arranged like a tactical operations center with staff cells, a war room and dedicated external Virtual Private Network (VPN) Internet connection to Germany and ESG (German SINCE Contractor). It provides unique real-time automated interoperability and information exchange between C2 systems of multi-national brigade, battalion and echelons below.

C2D Battle Command Laboratory - Fort Monmouth, NJ

This laboratory is used to develop advanced decision aid software for collaborative, execution-centric and mobile command and control. The laboratory supports software planning, collaboration, execution and mission analysis services for Joint Command and Control (JC2) that aid commanders and staff at brigade and echelons above. These services provide a seamless collaboration between higher echelon and lower units, tailor and manage the flow of information between horizontal and vertical infrastructures via net-centric managed connectors and increase the speed and quality of command decisions. They allow the commander to assign high-level inputs like missions, tasks and decision criteria in order to produce detailed plans, monitor dependencies and allocate resources.

C2D Tactical Internet Model (TIM) Suite Laboratory - Fort Monmouth, NJ

This laboratory is used for the development of C4I simulation software. This simulation software simulates and stimulates Army C3 systems during field exercises and tests. The primary customer is Army Test and Evaluation Center (ATEC) at Fort Hood, Texas. The software models the lower tactical internet including EPLRS and SINCGARS radio nets, and generates realistic message traffic for simulated platforms.

C2D Positioning, Navigation and Timing (PNT) Laboratory - Fort Monmouth, NJ

This laboratory is used to develop, demonstrate, model, simulate and integrate new technologies and system concepts in the areas of positioning, navigation, frequency control and timing. The laboratory contains the two Global Positioning System (GPS) Satellite Simulators (GSS), the CECOM Integrated GPS Navigation Model (CIGNM) and the Precision Navigation System (PNS). The GPS Satellite Simulators can emulate GPS satellites with trajectories that model various platforms and missions and can generate interfering sources such as jammers. CIGNM is a PC based navigation system simulation used to evaluate navigation system performance within numerous system configurations using different platforms and trajectories and operating in all types of environments such as jamming and terrain masking. The Precision Navigation System is a data acquisition and analysis tool used for evaluating advanced navigation components, systems and technology. It includes an accurate navigation reference, interfaces to accept data from a wide variety of systems under test and a comparison capability to evaluate the accuracy of the system under test. Also included in the laboratory are frequency control and timing measurement systems used to measure piezoelectric material properties and resonator and oscillator performance under various environmental conditions.

C2D C4ISR Automated Virtual Environment (CAVE) Laboratory – Fort Monmouth, NJ

This laboratory is an advanced visualization facility that combines high-resolution active-stereoscopic projection technology and 3-D computer graphics to create the illusion of immersion in a virtual environment. The facility is used to develop, analyze, and evaluate emerging C4ISR concepts for potential use in virtual, immersive environments.

C2D Rapid Operational Virtual Reality (ROVR) Laboratory – Fort Monmouth, NJ

This laboratory houses a brigade or battalion deployable mini-CAVE.

C2D Interactive Speech Technology (IST) Laboratory – Fort Monmouth, NJ

This laboratory is used to develop interactive speech technology including speech recognition and synthesis. The facility is comprised of a reverberant chamber and an anechoic chamber utilized for the characterization of various audio transducer technologies. The facility boasts an extensive library of military vehicle acoustic environment recordings useful for equipment performance evaluations and intelligibility testing. The laboratory possesses the worlds only high noise robust, speaker dependent, natural speech recognizers, including other key technology concepts in advanced speech recognition technology.

C2D Machine Foreign Language Technology (MFLT) Laboratory – Fort Monmouth, NJ

This laboratory is used to develop, accelerate and integrate the full spectrum of language translation technologies prior to fielding.

C2D Command and Control of Robotics Entities Software Development Laboratory – Fort Monmouth, NJ

This laboratory is used to develop advanced decision aid software for the collaborative, execution-centric command and control of robotic entities. This laboratory supports the development of tactical decision aid software services for the Future Combat System (FCS) Brigade Combat Team (BCT) with potential transition into current force command and control systems.

Intelligence and Information Warfare Directorate (I2WD) – Fort Monmouth, NJ

The I2WD conducts research, development, engineering and integration functions to ensure information dominance by providing enemy situation awareness, targeting, and electronic combat technology to the warfighter. Areas addressed include intelligence, surveillance and reconnaissance (ISR) sensors, ISR processing, electronic warfare, air/ground survivability (force protection), information operations, and ISR modeling and simulation (M&S).

I2WD Fabrication/Integration and Fielding Facility (FIFF) – Fort Monmouth, NJ

The FIFF is a 6,000 square-foot high bay area and a fully equipped facility for development and integration. The function of the fabrication/integration and fielding facility is to build proof-of-concept prototype systems for field testing and deployment. The goal of the FIFF is to provide cost-effective support of the I2WD community.

I2WD Anechoic Chamber – Fort Monmouth, NJ

The Anechoic Chamber facility is completely shielded, tested and certified to 110 dB of isolation. Outfitted with a state-of-the-art microwave measurement system, the facility is capable of performing tests quickly without sacrificing accuracy and sensitivity. The construction on a 20 foot by 18 foot door into the anechoic chamber has recently been completed. This allows vehicles to be moved into the chamber for system and EMI tests.

I2WD Seeker Effects Laboratory – Fort Monmouth, NJ

A Seeker Effects and an Anti-Tank Guided Missile (ATGM) Jam Lab, this facility offers electro-optic, infrared and laser infrastructure and facilities that afford: air and ground EO/IR threat exploitation and analysis; source to tracker/seeker effect analysis; jammer/source development and evaluation; countermeasure techniques development; digital IR missile modeling and simulation; closed-loop IR missile fly-out countermeasure evaluation and analysis.

CERDEC Flight Activity – Lakehurst NAES, NJ

The CERDEC Flight Activity provides the opportunity to conduct flight tests of C4ISR payloads for proof-of-concept and risk reduction. Specialized equipment is available to integrate payloads onto the air vehicles. The following platforms are available: UH-1H, UH-60A Blackhawk, C-12, C-23, and RC-12.

I2WD Quick Reaction Capability SIGINT Integration Laboratory – Fort Monmouth, NJ

This laboratory provides the Army intelligence community an infrastructure for the development and deployment of hardware technologies and equipment in support of survey and contingency operations.

I2WD Survivability Integration Laboratory – Fort Monmouth, NJ

The CERDEC Survivability Integration Laboratory (SIL) provides a unique Army facility supporting Platform protection, Area protection and Combat Identification technologies. The SIL facility hosts experimental and developmental systems, fielded systems, and digital models, and allows users to evaluate Electronic Warfare (EW) system characteristics in a controlled environment, test and evaluate the interoperability of EW systems, and develop and explore advanced concepts. The SIL provides a user the capability to simulate tactical scenarios and use either high-fidelity survivability sensor models or actual systems.

I2WD TROJAN Integration Laboratory – Fort Monmouth, NJ

This facility provides the capability to develop, prototype and integrate upgrades for the TROJAN family of intelligence dissemination systems. Upgrades can be tested via connectivity to other TROJAN systems throughout the world.

I2WD Distributed Common Ground Station – Army (DCGS-A) Software Integration Laboratory (SIL) – Fort Monmouth, NJ

This Government-managed integration activity facilitates software integration for DCGS-A Spiral four and five Initiatives. Provides the ability to evaluate technology solutions from Industry (and Government Programs), assist the Combat Developer in evaluating concepts and requirements, and assist in specification development and acquisition strategy for the DCGS-A Program. Promotes Innovation and showcases products and capabilities from Industry, Government, and Academia. The DCGS-A SIL provides Small Business Opportunities and a transition point for Army Science & Technology (6.3/TRL 5+) fusion initiatives. DCGS-A SIL is a federated virtual laboratory compliant with DIS/HLA and SMART protocols.

I2WD Digital Signals Processing & System Analysis Laboratory – Fort Monmouth, NJ

This facility enables I2WD engineering personnel to perform SIGINT prototype system level integration and testing. Engineers use the lab to fully characterize and verify the RF performance of delivered systems. Integration of new components and subsystems, developed under R&D, is also performed to enhance / upgrade system capabilities. The lab is equipped with a suite of test equipment, analog and digital, to conduct a variety of tests. The lab includes distributed antenna feeds for 'live' signal testing and a comprehensive signal 'library' to perform simulated signal testing. The lab also hosts the proper suite of digital signal processing software and work stations to develop signal processing algorithms and processing software.

I2WD Fusion Technology Test Bed – Fort Monmouth, NJ

This facility provides a means for conducting Multi-INT Exploitation. Develop collaboration tools that span across echelons (e.g., division/brigade combat team) and Battlefield Operating Systems (e.g., Distributed Common Ground System (DCGS) /All Source Analysis System (ASAS)). The Operators are provided with a set of tools that help with the spatial and temporal correlation. Includes SIGINT visualization of emitter tracks, automated critical node analysis, imagery intel (IMINT)/RADAR Moving Target Indicator (MTI) /visual MTI support of Common Operating Picture (COP) /Common Relative Picture (CRP), synchronized MASINT detection and analysis, Organic sensor /platform management and planning for Small Unit UAVs, robotic rensors, and robotic fire platforms, sensor support for pre-deployment, knowledge generation, acquisition of targets, sensing for force protection, and the surveillance 'Gap' between brigade combat team and division.

I2WD High Fidelity Digital Laboratory – Fort Monmouth, NJ

This facility provides an Information Operations Test Range (IOTR) allowing the Army to stay abreast of advances in computing and network technologies. The IOTR is designed to support research, development, design, testing, verification and validation, modeling, simulation and analysis capabilities in a distributed communications and networked environment. The IOTR is designed to operate at different classification levels, and has the capability to replicate real-world communications. By doing so, in depth analysis can be conducted on the interdependencies of communications protocols that make up current wired to wireless communications systems.

I2WD High Fidelity (HI FI) Wireless Test Facility – Fort Monmouth, NJ

This facility provides a state-of-the-art infrastructure to support research and development efforts requiring testing and analysis of wireless networks, protocols and the wireless RF environment. Additionally, the HI FI Wireless lab team provides support to a wide range of DOD customers with expert wireless analysis backed by genuine telecom and data communications network engineering experience in the HI FI Wireless Test Facility. The ultimate goal of this state-of-the-art facility is to provide the war fighter a facility that can effectively replicate and represent the RF environment of any potential area of operations through out the world. The HI FI wireless test facility will enable RDT&E of specific capabilities and associated tactics, techniques and procedures (TTPs) for any Electronic Warfare (EW) capability involving tele/data communications to support Information Operations.

I2WD High Fidelity Wireless Test Facility II (HI FI II) – Fort Monmouth, NJ

This facility provides a small RF enclosure for initial engineering testing in the HI FI lab. This chamber supplements testing performed in the Anechoic Chamber

I2WD IED Characterization and Exploitation Laboratory – Fort Monmouth, NJ

This facility provides electronic forensics, RF, and operational characterization on radio controlled IEDs (RCIEDs). Technical data and information on the communications equipment as well as triggering mechanisms are documented. Another part of the lab's mission is to influence the design of emerging countermeasure systems and the development of detection/neutralization techniques.

I2WD Counter-IED Laboratory – Fort Monmouth, NJ

This facility provides the capability to perform RDT&E of Counter-IED systems and prototypes in a controlled, instrumented, synthetic and actual environment.

I2WD Laser & Counter-Infrared (IR) IED Laboratory – Fort Monmouth, NJ

This facility provides the capability to research, develop, test & evaluate new techniques for Tank survivability and IR Improvised Explosive Device protection.

I2WD Radar & Counter-RCIED/Electronic Countermeasures (ECM) Applications Laboratory – Fort Monmouth, NJ

This facility provides RDT&E of platform protection, area protection and Combat Identification Technologies. The Lab focuses on currently fielded systems, the testing and evaluating of emerging systems and test and analysis of benefits of future concepts and technologies on survivability. The Lab concentrates on Airborne survivability against Radar controlled missiles and Ground survivability against Improvised Explosive Devices (IED).

I2WD Modeling & Simulation Computing Facility – Fort Monmouth, NJ

This facility makes available an operational, modeling and simulation environment that will provide the S&T and User Communities an ability to host their products for RDT&E, experimentation and demonstration.

I2WD Information Dominance Facility – Fort Monmouth, NJ

This facility enhances I2WD's ability to collaborate and leverage vast amounts of intelligence and information in a timely manner. I2WD's IDF is part of the IDC Network (IDCNet), an encrypted Virtual Private Network (VPN) tunneling through the Joint World-Wide Intelligence Communication System (JWICS), which allows for collaboration across the global IDC enterprise.

I2WD Modern Communications Shielded Enclosure – Fort Monmouth, NJ

This facility contains a radio frequency (RF) shielded enclosure for equipment and prototype testing. The RF screen room is required to prevent RF transmissions inside the Sensitive Compartmented Information Facility and to prevent unauthorized eavesdroppers from intercepting the transmissions. In addition this room is a dedicated facility for the processing, storage, and classified discussion of Special Projects Office program materials.

I2WD Radar Development Laboratory – Fort Monmouth, NJ

This facility serves as an evaluation and software integration facility for radar development and baseline performance assessment. The lab contains analysis tools for radar performance, exploitation performance and tracker performance within a simulated environment and with real sensor data. The lab also provides state-of-the-art exploitation tools and interfaces, for live demonstration and utility assessments.

I2WD Special Projects Office (SPO) Laboratory – Fort Monmouth, NJ

This facility contains equipment for RDT&E of specialized surveillance equipment for special customers.

I2WD Sense-through-the-Wall (STTW) Facility – Fort Monmouth, NJ

This facility is used for conducting RDT&E of handheld and robotic Sense-through-the-Wall (STTW) systems in static and motion detection modes, against stationary and moving objects and people. The facility includes all types of wall types (brick, cement, cement block, adobe, drywall and wooden) and density. Engineering, checkout or beta tests of nascent STTW technology may include am enclosed structure, a freestanding structure or even no structure at all initially. The I2WD test facility supports the changing of variables such as type and thickness of structure and standoff distance, and is completely controlled and instrumented. The STTW test facility is the only one of its kind and is crucial in helping the community understand the physics of the STTW problem with respect to types and shapes of targets (UXO, CW/CE, people, etc) vs non-targets (filing cabinets, metal safes, animals, etc) and the components of the technology (power, pulse, distance, Doppler, UWB, SAR, etc).

Night Vision and Electronic Sensors Directorate (NVESD)

The NVESD conducts research and development to provide the Warfighter with advanced sensor technology that will acquire and target enemy forces; detect and neutralize mines, minefields and unexploded ordnances; deny enemy surveillance and acquisition through electro-optics, camouflage, concealment, and deception techniques; provide for night driving and pilotage; and, protect troops and fixed installations from enemy intrusion.

NVESD IR Detector Fabrication Clean Room Facility - Fort Belvoir, VA

Housing both an ISO Class 5 clean room and a 'white' room, this facility is used to fabricate both cooled and uncooled infrared detectors and is at the forefront of the 3rd Gen focal plane array development participating with the FPA industry through Cooperative Research & Development Agreements CRDAs to develop semi-conductor processing techniques for multi-color detector structures. Photolithographic and metalization capabilities allow detector array patterning, reticulation, and contact metalization of grown samples. The 'white' room provides packaging and discrete device testing facilities.

NVESD Advanced Sensor Evaluation Facility (ASEF) - Fort Belvoir, VA

This facility characterizes sensors in such a way as to directly measure the relevant parameter used in the model during model development. Perception testing to determine the effect of sensor artifacts on human perception and hence field performance and design quality is performed in a series of specifically designed experiments.

NVESD Countermine Chemical Sensor Laboratory - Fort Belvoir, VA

This facility supports the research of chemical sensor development. The major focus will be on the detection of tactically buried land mines and unexploded ordnance (UXO). Other applications for chemical sensing technologies will also be explored. Space has been allocated for the trace chemical analysis laboratory and a gas chromatograph has been acquired for the detection and analysis of the trace quantities of explosives and their environmental degradation products that are leaked from land mines into surrounding air, ground water and soil.

NVESD Aviation R&D Sensors T&E Facility - Davison **Army Airfield, Fort Belvoir, VA**

This unique in-house facility has the capability to integrate system technology into various Army aircraft and to test sensor systems in an airborne environment. Aircraft used are two DH-6 Twin Otters, YEH60B Blackhawk and UH-1 Huey. The facility also contains infrastructure specializing in aviation support for integration, development, test, data collection and demos of airborne assets.

NVESD Distributed Sensors Integration Facility (DSIF) - Fort Belvoir, VA

This facility supports the integration and demonstration of small, low cost, targeting and ID sensors with day/night capability that are networked together with software tools. Sensor systems are integrated in the DSIF for deployment aboard unmanned platforms (e.g., unattended ground sensors (UGS), unmanned ground vehicles (UGV), and small-unmanned aerial vehicles (s-UAV)) to provide situation awareness for the ground commander to fill in the gaps from overhead ISR assets.

NVESD Fabrication and Integration Facility - Fort Belvoir, VA

This facility provides a comprehensive in-house manufacturing capability for prototypes, surrogates and components ranging from small high precision components up to armor steel and vehicle-based systems. It is Pro/Engineer 3-D CAD/CAM based and includes CNC machines and Abrasive Water Jet and Selective Laser Sintering (SLS) capabilities. It specializes in small quantity, custom, surveillance/optical systems and is fully equipped to construct and install prototype and surrogate items for R&D test beds.

NVESD Indoor Firing/Photometric Range Facility, Fort Belvoir, VA

This 100 meter indoor range is used to test Night Vision weapon sights and head-mounted sensors under various light levels using all types of standard and advanced military weapons. It contains a fully secured weapons storage vault in which the weapons are maintained.

NVESD Mine Lanes Facility - Fort Belvoir, VA

One of the few indoor mine lane facilities in the world, it consists of six indoor dry lanes and a greenhouse portion with six moisture controlled lanes. The dry lanes are each eight feet wide by 100 feet long holding six different soil types, the greenhouse lanes are eight feet wide by 60 feet long. The lanes are separated by non-metallic barriers. An overhead trolley system is used for mounting various mine detection sensors, and is fully automated and equipped with three axis motion control.

NVESD Optics Laboratory - Fort Belvoir, VA

A cornerstone of Night Vision since the 1960's, this lab provides impartial optical testing and analysis for a wide application of systems from the visible to the LWIR. Recent upgrades include a video based MTF test system for visible, NIR, and LWIR. Other capabilities include measuring veiling glare, stray light, afocal magnification, distortion, field of view, focal length, and spectral transmission of filters.

NVESD Field Test Range Facilities – Fort A.P. Hill, VA

Facilities include an Observation Range (Obs), a Laser Range, a Mine Range (71A), and an Airborne Minefield Detection Range. The Obs Range contains a heliport with two pads and a hangar, and a twelve bay observation building overlooking an 800x3500 meter long line-of-sight range with full instrumentation. The Laser Range supports safe testing of non-eyesafe lasers with four bays, an isolation platform and an elevated platform, and targets that can be deployed for ground and air testing at six discrete ranges. 71A is used for evaluation of ground-based mine detection and neutralization technologies. This 20-acre site is also used to evaluate the effects of mine blasts and fragmentation on personnel and equipment. The Airborne Minefield Detection Range is used to test and evaluate a variety of airborne sensors in detecting mines and minefields.

NVESD IR Detector Semiconductor Microfactory - Fort Belvoir, VA

A revolutionary approach to the rapid prototyping of semiconductor materials for future infrared sensors, this processing line uses vapor phase processes carried out in high vacuum cluster equipment that prevents contamination of the microchips as occurs in conventional manufacturing lines. The Microfactory features the ability to carry out all fabrication steps: epitaxial growth, metallization, etching and passivation while maintaining a wafer in the protective environment of a high vacuum system. New materials and processes developed are transitioned to industry to fabricate infrared focal plane arrays for DoD.

NVESD Virtual Prototyping and Simulation (VPS) Facility - Fort Belvoir, VA

A state-of-the-art facility that is used primarily to support advanced warfighting and technology assessment simulations, virtual reality experimentation, training support and video teleconferencing. Its capabilities are integrated with the Distributed Sensor Integration Facility (DSIF) to explore concepts of optimum sensor mixes and placements. High-end Silicon Graphics computers are used to generate the Paint-the-Night synthetic sensor simulation. The VPS is also physically linked with the CERDEC Combat Lab, the Mounted Maneuver Battle Lab at Ft. Knox KY, Army Research Lab, and other DoD R&D centers via the DREN (Defense Research and Engineering Network).

NVESD Prototype Infrared (IR) Focal Plan Array and IR Camera Characterization Lab - Fort Belvoir, VA

This laboratory is used for performance parameter characterization of advanced prototype cooled and uncooled mid-wave IR (MWIR) and long-wave IR (LWIR) staring focal plane arrays (FPAs) and MWIR and LWIR staring FPA-based prototype camera sensors.

NVESD Laser Laboratories - Fort Belvoir, VA

Nine laboratories dedicated to the development of compact, lightweight, low cost solid state lasers and laser-radars (LADAR) for Army applications. The laboratories include many optical benches with instrumentation for the development of novel diode pumped solid state lasers, laser materials research, prototype development and evaluation, and laser diode characterization. A clean room is available for critical laser assembly tasks.

NVESD S&T Rooftop Testing Facility - Fort Belvoir, VA

This is a unique laser and infrared camera rooftop testing facility. It allows lasers and sensors to see without being blocked by buildings or vegetation. Additionally, another unique feature is the platform on the far side of the facility where sensors can be set up to look down onto a grass and wooded area for collection data from targets such as land mines and vehicles.

NVESD Image Intensifier Test Facility - Fort Belvoir, VA

This laboratory has served government and industry since the inception of the Night Vision Laboratory by establishing and maintaining the standards for testing critical performance parameters in direct view night vision-imaging systems. System and subcomponent test capabilities include brightness gain, signal-to-noise, equivalent brightness input, modulation transfer function, limiting resolution, uniformity, spectral sensitivity, halo, visual quality, reliability, bright source protection, microchannel plate electron gain, resolution vs. light level, phosphor efficiency, and veiling glare. Imaging sensor test capabilities extend from the visible band to two microns enabling the characterization of noise and system performance in video-based sensors such as silicon and InGaAs.

NVESD Display and Image Fusion Laboratory - Fort Belvoir, VA

This laboratory provides National Institute of Standards and Technology (NIST) traceable test and analysis of direct view displays, miniature displays, and near-to-eye displays that includes monocular/binocular head mounted displays as well as weapon sights, viewfinders, and night vision goggles. The lab facilities also provide thermal and humidity environmental life testing for all the aforementioned displays as well as other vision system components. The image fusion laboratory collects temporally and spatially correlated visible, near IR and long wave IR sensor imagery.

NVESD Near/Short-Wave Infared Sensor Performance Characterization Facility - Fort Belvoir, VA

This laboratory is a low-light level device evaluation laboratory. The laboratory has been designed to assess passive solid state FPAs, CMOS devices, hybrid tube devices, test structures as well as complete camera systems that operate in the visible, near infrared (NIR) and short wave infrared (SWIR) spectral regions. The lab is equipped with both broadband and narrowband evaluation systems including calibrated 2856K blackbody sources capable of producing light levels from 10-6 to 10-1 Footcandles (or ~ 10-12 to 10-7 W/cm2). These light levels are ideal for replicating the spectral irradiance of the night sky from overcast to full moon conditions.

NVESD Automated Sensor and Processor Evaluation Center (AutoSPEC) Facity - Fort Belvoir, VA

This facility provides state-of-the-art technical evaluation of thermal sensors, processors, aided and automatic target recognizers and tracker equipment, and, in addition supports the data collections used for algorithm evaluations of aided target recognition systems. The facility supports all aspects of signal and image processing activities from data collections through algorithm development to algorithm evaluations and maturation. This facility has multiple terabyte SyneRAID storage systems and multiple multiprocessor and high performance workstations and servers in a climate controlled area. The SyneRAIDs and servers hold the terabytes of sensor data, ground truth, image metric databases, and algorithm analysis databases. The lab contains workstations for researchers to perform experiments, analysis, and evaluations of signal and image processing algorithms. Software tools developed specifically for the algorithm evaluations are resident on these stations.

NVESD Countermine Radar and Electromagnetic Induction (EMI) Laboratory - Fort Belvoir, VA

This laboratory provides for state-of-the-art in-house research of radar and electromagnetic induction sensors and is equipped with the tools and testing platforms necessary to evaluate commercially available and research-grade antennas and coils as well as investigate innovative new detection techniques. EMI research focuses on optimizing coil configurations, transmitter waveforms, and algorithms for detection and discrimination of mines, unexploded ordnance (UXO), and improvised explosive devices (IED). Radar research focuses on optimization of ground penetrating radar antennas with respect to signal gain, system resolution, and antenna footprint size.

NVESD Countermine Acoustics Laboratory - Fort Belvoir, VA

This laboratory supports the development of sensor technologies specifically for acoustic mine detection applications. Acoustic mine detection systems exploit the structural resonances of landmines to discern the location of a buried mine from an off-target measurement. Current research projects in the acoustics laboratory include the development of an ultrasonic displacement sensor, an investigation of ultrasonic parametric arrays as an alternative acoustic source, and a study of wave propagation in soils with the objective of optimally exciting landmine structural resonances. The acoustics laboratory is also developing an acoustic confirmation sensor, which will be capable of scanning a one square-meter area for landmines in 20 seconds or less.

NVESD Human Test and Perception Laboratory - Fort Belvoir, VA

This laboratory's purpose is to contribute to scientific knowledge about the human visual system, behavior, and performance as it relates to the perception of imagery from electro-optical sensors. The perception approach is experimental, utilizing real thermal imagery, military subjects, and state-of-the-art computer systems. All perception studies relate directly to the development of better thermal systems and the optimization of system performance in effort to reduce fratricide. The lab also consists of two of a very limited number of ISCAN eye-tracking systems. These systems are used to better understand human eye-movements, such as the effects of thermal clutter during search and identification of a thermal scene. These experiments are performed in effort to collect human performance data and ultimately to validate the system models. The models mathematically describe a sensor's capability and predict sensor performance.

NVESD DoD Smart Gate (SG) Facility - Fort Belvoir, VA

This facility is an autonomous entry gate test bed built by NVESD in support of the Product Manager for Force Protection Systems. The goal of the SG Project is to reduce the number of guards required to check vehicles and personnel IDs, improve the flow of vehicles through access checkpoints, and verify access authorization of vehicles and personnel. Other technologies currently under test include swing-arm gates, magnetic disturbance proximity sensors, inductive loop sensors, and photo-electric light curtains

NVESD Unmanned Aerial Vehicle (UAV) Laboratory - **Davison Army Airfield, Fort Belvoir, VA**

The UAV laboratory serves as the primary support facility for the integration, maintenance, and support of UAV sensor experimentation. NVESD maintains a number of in-house UAV test-bed aircraft including Small UAVs such as the Army's Raven and Pointer, and larger VTOL UAV, and fixed wing UAV prototypes. Each of the UAV aircraft is special purpose modified for the purposes of experimentation, flight-testing, and demonstration of various types of sensor payloads.

NVESD Networking Facility - Fort Belvoir, VA

This facility houses the NVESD NIPRNET server farm including file servers for NVESD imagery, project space, E-mail servers, Print Servers, and, backup servers. The file servers contain over six Terabytes of digital terrain imagery that was collected with various NVESD sensors and some digital terrains. UNIX application servers use the imagery for Modeling and Simulation (M&S) experiments. The project space servers allow the NVESD engineers to write and store their M&S and Automated Target Recognition (ATR) algorithms.

NVESD High Bay Integration/Night Vision Device Repair Facility - Fort Belvoir, VA

An integration and repair facility specializing in small quantity, custom-built, surveillance systems. The facility is fully equipped to construct and install prototype and surrogate items for R&D test beds, perform light machining operations, and repair night vision devices.

NVESD Countermine Prototype Systems Laboratory - Fort Belvoir, VA

This laboratory evaluates tele-operated or remotely controlled vehicle-based mine/IED detection and neutralization technologies. Technologies are evaluated for their effectiveness as remotely-controlled data collection systems for operation at countermine field sites prior to field data collections. The laboratory is used to integrate and test different components onto the different systems that are being developed.

NVESD Countermine Systems Laboratory (CMSL) - Fort Belvoir, VA

This laboratory fills a need for standardizing and maintaining characterizations of sensors deployed in countermine detection systems, as well as the characterization of the sensor signal and data acquired during testing. The laboratory is equipped to advance the state of the art of Nuclear Quadrupole Resonance (NQR) technology applied to landmine detection; airborne sensor and data processing technology applied to airborne mine, minefield, IED and obstacle detection; sensor data processing technologies applied to landmine detection; and specialized geospatial intelligence processing in support of selected countermine mission areas.

NVESD Electronics and Glass Laboratories - Fort Belvoir, VA

The Electronics Laboratory performs electronic transport measurements on HgCdTe and related infrared materials. These measurements include high-field (9T) Hall effect measurements, and photoconductive carrier lifetime measurements. This laboratory also evaluates the performance of infrared detectors. The Glass Laboratory has the unique facilities and expertise to produce sealed quartz annealing tubes for high temperature processing of HgCdTe and related semiconductor materials.

NVESD Humanitarian Demining Laboratory - Fort Belvoir, VA

This laboratory supports the DoD Humanitarian Demining Program and focuses on in-house prototype development from concept to fielding. Capabilities include design, fabrication, modeling, integration and testing of demining equipment. The laboratory specializes in electronic, hydraulic and system control; and has state of the art surface mount electronic printed circuit board capabilities that include board testing and software development.

NVESD Image Evaluation Facility - Fort Belvoir, VA

This facility is used to perform advanced laboratory research to develop new measurement methodologies and metrics associated with existing, new, and emerging EO/IR systems, such as third Gen, hyper-spectral, super resolution, passive/active millimeter wave/Terahertz, and active imaging and to characterize EO/IR physics at the system and/or component level for the purposes of supporting sensor performance model research.

NVESD Imaging Technology Environmental Test Facility - Fort Belvoir, VA

This facility is used to perform operational evaluation of imaging systems and components under military specification thermal conditions to aid in the development of technologies and to ensure the capability of designed components and systems.

NVESD Laser Test Tunnel - Fort Belvoir, VA

This facility is a 55-meter long enclosed space in which lasers and remote sensing systems can be tested as well as performing alignment and measurement of laser rangefinders and laser radar (LADAR) equipment. The enclosed nature of the tunnel allows high power laser systems to be operated safely with a minimum of precautions.

NVESD Optical Improvement Laboratory - Fort Belvoir, VA

This laboratory measures night vision devices and cameras to determine their vulnerability to hostile detection, jamming and destruction. It also performs the research, design, fabrication, and testing of protection improvements to these devices and cameras. Testing involves the use of lasers of varying power levels (eye-safe and not eye-safe) of varying wavelengths. Testing also involves the use of numerous night vision devices and camera systems that cover the spectrum range from visible through the long wave infrared band.

NVESD Processor Development Laboratory - Fort Belvoir, VA

This laboratory is utilized for all aspects of processor development from design to test and evaluation. Tradeoffs between various processor architectures, inter-processor communication protocols, and types of processing are done. A processor subsystem can be modeled to verify functionality and to ensure it meets requirements. Laboratory test-beds can be programmed with various types of algorithms and sensor types for target detection applications and can be utilized in processor evaluations and demonstrations.

NVESD Readout Integrated Circuit (ROIC) Laboratory - Fort Belvoir, VA

This laboratory measures night vision devices and cameras paying particular attention to the system issues associated with the ROIC such as nonlinearity and nonuniformity. It also performs the research, design, fabrication, and testing advanced ROICs for these devices and cameras. Testing involves the use of light sources of varying wavelengths from the UV, visible, NIR, SWIR, MWIR and LWIR.

NVESD X-Ray Diffraction Analytical Laboratory - Fort Belvoir, VA

This laboratory is used to characterize the nature and quality of crystalline layers and substrates used for the fabrication of infrared focal plane arrays, utilizing x-ray diffraction techniques. The laboratory provides rapid feedback measurements to crystal growers, allowing them to make an informative decision on how to improve future growth runs based on x-ray diffraction analysis. It also provides broad support by offering x-ray diffraction measurement and analysis. This analysis provides valuable insight into nearly every aspect of infrared focal plane array manufacturing, including substrate evaluation, crystal growth and device processing.

NVESD Molecular Beam Epitaxy (MBE) Development Laboratory - Fort Belvoir, VA

This laboratory contains a state-of-the-art molecular beam epitaxy chamber designed for deposition of the highest quality HgCdTe. Equipment is used for the creation of state-of-the-art infrared photovoltaic diode structures on CdZnTe and Si substrates. Exploration of new materials and device structures are made possible by the equipment's very high film quality and precise composition, doping, and thickness control.

NVESD System Engineering, Analysis, and Integration Laboratory (SEAIL) - Fort Belvoir, VA

This laboratory is an integrated systems laboratory complex dedicated to the development and improvement of ground-based NV/EO and electronic systems providing the capability for the rapid characterization and analysis of applied technologies. The functions of the SEAIL facility include (1) integration of laser based technologies, visible imaging and CMOS CCD I2 imaging with Forward Looking Infrared (FLIR) imaging technologies, near IR, Short Wave IR (SWIR), 1-2um solid state and 1.54um imaging; (2) motion stabilized uncooled FLIR stereo vision and non-stabilized absorption band illumination combined with stereo vision for UGV obstacle detection; (3) evaluation of militarized uncooled large and small format cameras; (4) rapid test, evaluation, and analysis of the system and system of systems capabilities while in the development stages and/or during system integration; (5) engineering capabilities of system design, rapid and experimental prototyping, integration and testing including the latest capabilities in CAD engineering workstation rapid prototyping; (6) algorithm analysis and advanced digital signal processing; (7) latest engineering capabilities in high density FPGA, PLD and surface mount technologies along with electronic circuit design, timing synthesis and printed circuit board design; (8) in-laboratory field test preparation, system configuration/ reconfiguration, repair, maintenance, and support; and (9) evaluation of cooled Infrared Focal Plane Arrays (FPAs), Detector Dewars, and Integrated Dewar/Cooler Assemblies (IDCAs); (10) quick turnaround testing and evaluation capability for Modular Eyewear Protection System (MEPS) hardware.

Space and Terrestrial Communications Directorate (S&TCD)

The S&TCD acquires, develops and integrates secure seamless tactical communications for the digitized battlefield. Research, development, and engineering functions are conducted in all aspects of terrestrial, avionics, and space-dependent communications technology to include adaptive, reliable seamless battlefield communications with full electronic counter-countermeasures capability and information security (INFOSEC).

S&TCD Mobile Networking Lab

The Mobile Networking Laboratory evaluates, demonstrates, and adapts existing commercial off-the-shelf (COTS) and emerging WLAN technology (from in-house R&D programs) for military applications. The technologies studied are 802.11a,g, 802.16 and various implementations of these technologies within various products such as breadcrumb relays for dismounted applications, PDAs, and secure mobile network environments such as flying LANs and mobile command posts. The primary focus is to discover and provide support to all proposed mobile networking application areas, which include dismounted platforms Land Warrior and Future Force Warrior, sensor network platforms and Tactical Operation Centers. Various testing and analysis areas include Interoperability studies, Interference studies, security and encryption studies, robust communications and wireless PDA applications.

S&TCD Terrestrial Personal Communications Systems (PCS) Laboratory

The PCS Laboratory supports the development of wireless communications systems and provides the warfighter at brigade and above a secure wireless communications capability. It is currently a threshold requirement under the WIN-T program. This Advanced Wireless Communications Integration Laboratory provides for evaluation and testing of emerging commercial cellular network technologies, primarily Code Division Multiple Access (CDMA) and 3G UMTS/WCDMA technologies. The lab also contains secure type one cellular phones and commercial non-secure phones.

S&TCD Electromagnetic Interference/ Electromagnetic Compatibility (EMI/EMC) and Antennas Laboratory

The EMI/EMC Laboratory is a fully equipped laboratory to address all types on interference issues. The first chamber is ferrite lined on all inside surfaces to reduce RF reflections. Anechoic absorber cones compliment the structure on all walls to reduce higher frequency reflections. It provides over 110 dB of isolation, which is ideal for performing pre-certification RE102 MILSTD 461 testing and electromagnetic compatibility studies between systems. The second chamber is a fully lined anechoic chamber. It provides over 100 dB of isolation, is certified for MILSTD-461 testing, and is useful as an electromagnetic compatibility test environment. It is also supplied with a large variety of support and test equipment ranging from network analyzers, spectrum analyzers, EMI receiver, power supplies, impulse and signal generators, filters, attenuators, couplers, soldering station and more, making it a self-contained EMI/EMC test house. The laboratory's data collection and post processing system software was designed and developed in-house allowing and tailored specifically for S&TCD's unique needs. The EMI/EMC Laboratory is multi-faceted and designed to address issues such as RF interference and electromagnetic compatibility. The S&TCD mission is to evaluate the effects of electromagnetic interference and determine electromagnetic compatibility between new and legacy system equipment. This testing can be performed in-house with the added benefit of in-house expertise to address/reduce problems, such as high radiated emissions, therefore final testing is performed with a high level of confidence in a pass. This laboratory is integral to the frequency assignment and frequency allocation process. The EMI/EMC group is instrumental frequency approvals for several systems to operate in the same battle space as legacy systems by proving electromagnetic compatibility between systems.

S&TCD Advanced Internet Protocol Version 6 Research Laboratory

The IPv6 Laboratory provides for the evaluation and testing of emerging commercial network technologies directly impacting the Army Enterprise Architecture (AEA) and supporting the Army transition to IPv6. Utilizing actualized data correlation resources the laboratory provides the capability to analyze and assess emerging network protocols and related standards, evaluate suitability for military applications, determine feasibility for accelerating insertion of emerging network technologies, and identifying interoperability issues with legacy, interim, and future Army network communication systems. The IPv6 Laboratory's topology emulates realistic Army tactical scenarios and Joint strategic network communications in a unique multiple Internet Protocol (IP) Standards, IPv4 and IPv6, laboratory environment. The IPv6 Laboratory is equipped with wired and wireless assets for testing and measuring compliance and performance of IPv6 based products in a military environment.

S&TCD Joint Tactical Radio System (JTRS) Integration and Cosite Laboratory (JICL)

JICL conducts communication systems integration testing and analyses of emerging JTRS prototypes and integration technologies, to provide recommendations to Program Managers for the successful integration of JTRS into Army tactical ground and airborne platforms. Integration technologies include multiband multiplexers, interference cancellation and agile filtering devices, wideband power amplifiers and multiband high power antennas covering the 30-3000 MHz frequency band.

S&TCD Antenna Test and Validation Laboratory

CERDEC's S&TCD Antenna Test and Validation Laboratory consists of two major antenna test facilities. The first facility is a large fully anechoic antenna test chamber, fully equipped with antenna measurement equipment, to include network analyzer, spectrum analyzers, VSWR meters, signal generators, two axis antenna positioner for full hemispherical antenna pattern measurements and other assorted equipment. The chamber is capable of accurate measurements. Data collection and post processing software fully automates the system and was written in-house specifically for this setup. The second facility is an open area antenna test site located at Lakehurst, NJ. The Lakehurst facility compliments our anechoic chamber, by extending the lower bounds of our frequency measurement capability to as low as we need to measure along with allowing measurements of antennas on platforms such as vehicles, and helicopters. At the Lakehurst facility we also have a portable two axis antenna positioner capable of holding vehicles such as an Unmanned Aerial Vehicle to assist in testing antenna effects on a platform. The laboratory supports any and all antenna development to include ground based antennas, airborne/aviation antennas, and emerging standard and broadband body-borne antennas. It is equipped to perform antenna validation measurements and also has the ability to perform modeling and simulation of these antennas and incorporate them onto a wide variety of vehicles or platforms. This combination of capabilities assures proper antenna placement with minimal interference from both on-board radiated emissions and also minimizes coupling of signals from other antennas while providing the best antenna patterns and ultimately the highest achievable levels of communications for a particular platform or application.

S&TCD JTRS Army Center of Excellence Lab (JACEL)

The JACEL facility is used for testing legacy, and advanced ground and aviation radio systems such as EPLRS, SINCGARS, HF, and VHF LOS for compliance with both current and future military standards. It has the capability, facilities, and equipment to perform various electrical, RF performance, and interoperability testing on radio systems to include: 1) Receiver sensitivity (both analog and digital) 2) Receiver/Transmitter residual Bit Error Rate (BER) 3) Transmitter output power 4) Battery life at various duty cycles 5) Voice, digital data performance, and combined voice and data performance under various RF environments (cosite, noise, jamming) 6) Legacy waveform interoperability testing of SINCGARS, EPLRS, HF and VHF LOS systems 7) RF propagation analysis for the selection of optimum network frequency. The JACEL also provides a complete end-to-end test environment to support the integration and testing of both current and future tactical packet data network communications systems within the Army's upper and lower Tactical Internet (TI) architecture. Its purpose is to sponsor experimentation and technology demonstrations that will enhance the following TI based technologies: 1) Perform test and evaluation to integrate tactical host/communication systems into the current TI architecture 2) Validation testing of proposed hardware and software based additions and enhancements to the existing TI network architecture 3) Review, test, evaluate, and recommend new and improved terrestrial communications technologies, which lead to enabling the US Army's transformation to the Future Combat System (FCS) Future Force. This includes Software Defined Radios and SCA architectures. The JACEL provides both test result data and recommendations to contractors and Program Managers to enhance current network architecture and communications software for the TI.

S&TCD Cryptographic Modernization Laboratory

The Cryptographic Modernization Lab efforts are currently focused on a Secure Global System for Mobile communications (GSM) for the Warfighters in Iraq and elsewhere in the world. Testing for a Network Encryption Device (NES) replacement (currently on the DoD priority list) is also taking place, as is testing of other COMSEC devices such as the SecNet 11, KG-235, KG 240 and others occur within this lab. The lab is used for the following (classified up to Top Secret) mission essential requirements: SIPRNET Access; test and evaluation of COMSEC equipment; use of COMSEC keys; demonstrations of networks and equipment; RF isolated tests; and as a repository of Top Secret documentation and classified equipment; receipt and transmission of classified faxes; and classified meetings.

S&TCD Infosphere Laboratory

The Infosphere Lab has the ability to build up and tear down Army representative networks with state of the art equipment with ease and flexibility. It is currently used for C2 Protect COTS/GOTS software evaluations, the Tactical Wireless Network Assurance effort and engineering support on other projects such as TPKI. The equipment in use in this lab includes CISCO gear, numerous workstations configured with multiple operating systems including Windows, Solaris and Unix. The COTS/GOTS software evaluations work in direct support of the tactical warfighter. Other tools that are continually reviewed are network firewalls, intrusion detection systems and more recently intrusion prevention systems, which provide the ability to stop network attacks before they occur rather than after they have penetrated a network.

S&TCD IPv6 and IP-Sec Laboratory

The Gigabit Ethernet communications network has been established in the lab using testing. Investigations are conducted into the Internet Protocol Security (IPsec) portion of the Ipv6 standard.

S&TCD Antenna Modeling and Simulation Laboratory

The Antenna Modeling and Simulation Laboratory uses computer modeling and simulation to solve electromagnetics problems. This includes optimization of antenna placement on vehicles and fix-site installations, antenna and vehicle structure coupling, cosite interference mitigation, and antenna selection and design EMI/EMC analysis. The Antenna Modeling and Simulation Laboratory supports any and all antenna development to include ground based antennas, airborne/aviation antennas, and emerging standard and broadband body-borne antennas. It is equipped to perform modeling and simulation of these antennas and incorporate them onto a wide variety of vehicles or platforms. This combination of capabilities assures proper antenna placement with minimal interference from both on-board radiated emissions and also minimizes coupling of signals from other antennas while providing the best antenna patterns and ultimately the highest achievable levels of communications for a particular platform or application. This modeling capability along with the adjacent Antenna Test Laboratory has greatly increased the efficiency during development, testing and validation of new antenna systems. The Antenna Modeling Laboratory currently utilizes the following tools to assist in antenna development and positioning on platforms: Numerical Electromagnetics Code (NEC), GNEC, Finite Difference Time Domain (XFDTD) codes, Co-Site Analysis Model (COSAM), Geometric Theory of Diffraction (XGTD), Joint E3 Evaluation Tool (JEET), Genesys, MATLAB, PSPICE and an assortment of other CAD programs to support our work.

S&TCD System Engineering, Architecture and Modeling & Simulation (SEAMS) Laboratory

This laboratory performs a broad range of Modeling & Simulation (M&S) functions for radio communication systems, modeling of the OSI protocol stack, discrete event simulation and distributed simulation capabilities. It uses standard modeling tools such as OPNET, QualNet, and OneSAF Test bed (OTB) able to model/analyze terrain effects, routing, and mission/application layer overhead in given tactical scenarios. It performs simulation-based scalability analysis of Mobile Ad Hoc Network Protocols using Mobile Ad Hoc Network (MANET) protocols. It hosts the Next Performance Model (NGPM), a high fidelity model of the Tactical Internet, as well as models written for the Small Unit Operations (SUO), and FCS-C programs. A Communications Effects Server (CES) is being built to simulate communications effects in a distributed man-in-the-loop war gaming simulation. It supports design, analysis and evolution of tactical communication systems through systems engineering analysis with architectural and modeling and simulation. Includes discrete event simulation and distributed simulation; it can perform communication effect analyses and other modeling/analysis capabilities. It uses standard modeling tools such as OPNET, QualNet, IBM's Rational Rose, the OneSAF Test bed (OTB), ALCES and ComTest. These tools model and analyze terrain effects, routing, and mission/application layer overhead within a given tactical scenario. It hosts models for the Small Unit Operations (SUO), FCS-C and Warfighter Information Network-Tactical (WIN-T) programs. A universal Communications Effects Server (CES) is being built to perform Independent Validation and Verification of the WIN-T radio, network device models and development of a network planner combined with communication effects.

S&TCD Communications System Design Center (CSDC)

The CSDC facility is used to perform applied research in communications technology with the objective of developing and integrating next-generation communication systems for the Army. The CSDC laboratory enables the rapid analysis, prototype integration and testing of Non-Developmental Items (NDI) and Commercial-off-the-Shelf (COTS) as well as Government Off-the-Shelf (GOTS) products, and is used for evaluating and experimenting with fielded voice and data communications systems. The CSDC laboratory includes:
1) WIN-T/BSN Testbed; 2) MSE support facility; 3) Development engineering facility; 4) Networks management facility; 5) NOC-V; Testbed 6) Battlefield video teleconference Lab; 7) Simulation base training development lab.

S&TCD Network Operations (NETOPS)

The NETOPS facility is used to perform applied research in communications technology with the objective of developing and integrating next-generation communication systems for the Army. The NETOPS Laboratory enables the rapid analysis, prototype integration and testing of Non-Developmental Items (NDI) and Commercial-off-the-Shelf (COTS) as well as Government Off-the-Shelf (GOTS) products, and is used for evaluating and experimenting. The major functions of the NETOPS facility are: 1) Support architecture design, state-of-the-art technology insertion, joint and legacy integration testing, troubleshooting and field support, and a training/testbed for the Warfighter; 2) Software development and prototyping of network operations functions, Information Assurance, Network Management, and Information Dissemination Management; 3) Net-centric service development for the First Responder community of interest (COI) and the Tactical NetOps COI; 4) Acquisition, development, and integration of COTS and GOTS technology providing secure tactical communications to the Warfighter and the first responder.

S&TCD Joint Satellite Communications (SATCOM) Engineering Center (JSEC)

The Joint SATCOM Engineering Lab (JSEL) complex is a unique, state-of-the-art facility with over $200M in strategic/tactical satellite communication assets that supports all DOD agencies/services and special users. It has four functional areas: the Strategic Systems Lab (SSL), DoD Teleport Test Bed (DTT), Control Systems Lab (CSL), and Tactical Systems Lab (TSL). The SSL has two Defense Satellite Communications System (DSCS) X-band earth terminals, X-band TACSAT terminal, a C-band, Ku-band, EHF and UHF terminals, a DSCS III satellite simulator (only one in existence) and C, Ku band simulators, Standardized Tactical Entry Point (STEP), modem and X-band certification equipment. It is the only facility authorized by DISA to do terminal/base band certification testing. SSL has new base-band equipment for DTT site-specific functions and will support operational teleport as performing anomaly resolution investigations. It will support ARSPACE as their Ka-band earth terminal certification test agent. A new Ka terminal will be installed along with a Ka Band WGS Satellite Simulator. The CSL is designed to do research, design, development, testing, evaluation, anomaly resolution and analysis of DSCS and WGS control systems and components. It emulates a complete DSCS Operations Control System (DOCS) facility, and has subsystems, hardware, software and test equipment found at DSCS Operations Centers. CSL interfaces with other Test Facilities, collocated strategic earth terminals, DSCS III satellite simulator, and the CECOM Software Engineering Center. The TSL has three major lab areas, UHF, SHF and EHF, used to support software verification, test/evaluation, and anomaly resolution of tactical SATCOM terminals. SEL test labs support new software testing for legacy systems, certify new satellite earth terminals for use over DSCS, and assist all DOD agencies/services/Army Space Command by trouble shooting problems that occur on fielded systems.

S&TCD Advanced Network Laboratory

The Network Laboratory was developed to test functionality and performance of advanced networking protocols and platforms developed under the Multifunctional On-The-Move Secure Adaptive Integrated Communications (MOSAIC) Advanced Technology Demonstration (ATD) program. The laboratory provides the capability to test newly developed networking protocols as well as the functionality of command and control, video, and situational awareness applications, such as those from PM FBCB2, over a MOSAIC technology-driven network. The lab is connected to the Government Integration Center (GIC) fiber optic backbone enabling linkage to other laboratories at Fort Monmouth for integrating and testing other technologies with MOSAIC technology-enabled networks. The laboratory has upgraded its capability to allow testing of any radio system, protocols or applications. It also provides several software development environments for UNIX, Linux, and Windows, including java, C(++,#), and MATLAB. The laboratory has GPS, RF and fiber connections to strategic points on the roof for concurrent indoor and outdoor testing. As part of this upgrade, located within the Network Lab is the Wideband Radio Networking Testbed (WRNT). This testbed is a computer automated wideband radio mobile network RF connectivity emulator, which is used to test Mobile Ad-Hoc Networking (MANET) radios in a scripted repeatable tactical mobile network environment, thus eliminating the expense and complexity of actual field testing or to allow for baseline testing of networking radios and associated advanced protocols prior to conduct of live field experiments.

S&TCD Subterranean Communications Networks Laboratory

This lab will provide an environment for investigating propagation, channel characterization and the best methods for wireless communications with a broad spectrum of electromagnetic and radio frequency signals in subterranean/underground environments and confined areas. Wireless communication techniques will be studied for use in both rural (caves & mines) and urban settings (within multi-story buildings, subways, tunnels, basements, etc.). The technologies that are used to perform research in subterranean wireless communications networks include MIMO, ultrasound, magnetic induction, and RF techniques coupled with networking technologies within the 802.11 family and other emerging standards. The Subterranean Communications Networks Lab will be the focus of subterranean communications research within RDECOM, and will support interfaces to emerging Army platforms such as Future Combat System, Joint Tactical Radio System, Tactical/Urban Unattended Ground Sensors, Land Warrior and Future Force Warrior.

S&TCD Dismounted Soldier and Unattended Sensors and Munitions Networked Communication Laboratory

The Dismounted Soldier, Unattended Sensor and Munition Laboratory supports the development, evaluation and troubleshooting of current, near-term and future technology that significantly enhance the capability and survivability of tactical Army communications. Technologies supporting dismounted Soldiers, unattended ground sensors/munitions, and unattended air vehicle communications systems include energy efficient networking protocols, state of the art signal in space waveforms, Multiple Input Multiple Output (MIMO) signal processing techniques, video/inter-network header compression software and radio miniaturization hardware. This lab is also used to ensure the technologies are suitable for field testing for formal acquisition programs such as the Joint Tactical Radio System (JTRS) Soldier Radio Waveform (SRW) and the Intelligent Munitions System. Lab check-out is an important first step in the evaluation process to ensure the technologies perform as designed. This lab facility has the instrumentation and facilities required to measure the technical performance achieved versus the requirements. The SRW is integrated with many battle command systems in the lab using the Soldier Level Integrated Communications Environment (SLICE) prototype radio hardware for end to end communication system evaluation. The radio networks are used to exercise all modes of the SRW including the maximum throughput mode as well as the secure and stealthy mode. The lab allows comparisons to be made using test instrumentation and data analysis tools to evaluate data throughput, data latency over multiple hops, network convergence, network formation, network adaptability, robustness, security, jam resistance, and energy efficiency for battery dependent systems.

Capabilities at a Glance

(located at Fort Monmouth, NJ unless otherwise noted)

CERDEC Government Integration Center (GIC)

C2D Power Source Research, Development, Test, and Evaluation Laboratory

C2D Test and Evaluation Laboratory

C2D Power Source Research and Development Laboratory

C2D Power Generation Laboratory - Ft. Belvoir, VA

C2D Environmental Control Development/Test Laboratory - Ft. Belvoir, VA

C2D Fuel Cell Technology Laboratory - Ft. Belvoir, VA

C2D Environmental Test Facility

C2D Fabrication Facility

C2D Systems Engineering Integration Laboratory

C2D Integration Facility

C2D Inventory Control, Parts and Materiel Handling Facility

C2D Virtual Prototyping Laboratory

C2D Improved Data Modem (IDM) Laboratory

C2D High-Frequency (HF) Tracker Laboratory

C2D Simulation and C2 Information Systems Connectivity Experiments (SINCE) Laboratory

C2D Battle Command Laboratory

C2D Tactical Internet Model (TIM) Suite Laboratory

C2D Positioning, Navigation and Timing (PNT) Laboratory

C2D C4ISR Automated Virtual Environment (CAVE) Laboratory

C2D Rapid Operational Virtual Reality (ROVR) Laboratory

C2D Interactive Speech Technology (IST) Laboratory

C2D Machine Foreign Language Technology (MFLT) Laboratory

C2D Command and Control of Robotic Entities Software Development Laboratory

I2WD Fabrication/Integration and Fielding Facility (FIFF)

I2WD Anechoic Chamber

I2WD Seeker Effects Laboratory

I2WD CERDEC Flight Activity - Lakehurst NAES, NJ

I2WD Quick Reaction Capability SIGINT Integration Laboratory

I2WD Survivability Integration Laboratory

I2WD TROJAN Integration Laboratory

I2WD DCGS-A Software Integration Laboratory

I2WD Digital Signals Processing & System Analysis Laboratory

I2WD Fusion Technology Test Bed

I2WD High Fidelity Digital Laboratory

I2WD High Fidelity (HI FI) Wireless Test Facility

I2WD High Fidelity Wireless Test Facility II (HI FI II)

I2WD IED Characterization and Exploitation Laboratory

I2WD Counter-IED Laboratory

I2WD Laser & Counter-Infrared (IR) IED Laboratory

I2WD Radar & Counter-RCIED/Electronic Countermeasures (ECM) Applications Laboratory

I2WD Modeling & Simulation Computing Facility

I2WD Information Dominance Facility

I2WD Modern Communications Shielded Enclosure

I2WD Radar Development Laboratory

I2WD Special Projects Office (SPO) Laboratory

I2WD Sense-through-the-Wall (STTW) Facility

NVESD IR Detector Fabrication Clean Room Facility - Ft. Belvoir, VA

NVESD Advanced Sensor Evaluation Facility (ASEF) - Ft. Belvoir, VA

NVESD Countermine Chemical Sensor Laboratory - Ft. Belvoir, VA

NVESD Aviation R&D Sensors T&E Facility - Davison Army Airfield, Ft. Belvoir, VA

NVESD Distributed Sensors Integration Facility (DSIF) - Ft. Belvoir, VA

NVESD Fabrication and Integration Facility - Ft. Belvoir, VA

NVESD Indoor Firing/Photometric Range Facility, Ft. Belvoir, VA

NVESD Mine Lanes Facility - Ft. Belvoir, VA

NVESD Optics Laboratory - Ft. Belvoir, VA

NVESD Field Test Range Facilities - Ft. A.P. Hill, VA

NVESD IR Detector Semiconductor Microfactory - Ft. Belvoir, VA

NVESD Virtual Prototyping and Simulation (VPS) Facility - Ft. Belvoir, VA

NVESD Prototype Infrared (IR) Focal Plan Array & IR Camera Characterization Lab - Ft. Belvoir, VA

NVESD Laser Laboratories - Ft. Belvoir, VA

NVESD S&T Rooftop Testing Facility - Ft. Belvoir, VA

NVESD Image Intensifier Test Facility, Ft. Belvoir, VA

NVESD Display and Image Fusion Laboratory - Ft. Belvoir, VA

NVESD Near/Short-Wave Infrared Sensor Performance Characterization Facility - Ft. Belvoir, VA

NVESD Automated Sensor and Processor Evaluation Center (AutoSPEC) Facity - Ft. Belvoir, VA

NVESD Countermine Radar and Electromagnetic Induction (EMI) Laboratory - Ft. Belvoir, VA

NVESD Countermine Acoustics Laboratory - Ft. Belvoir, VA

NVESD Human Test and Perception Laboratory - Ft. Belvoir, VA

NVESD DoD Smart Gate (SG) Facility - Ft. Belvoir, VA

NVESD Unmanned Aerial Vehicle (UAV) Laboratory – Davison Army Airfield, Ft. Belvoir, VA

NVESD Networking Facility - Ft. Belvoir, VA

NVESD High Bay Integration/Night Vision Device Repair Facility - Ft. Belvoir, VA

NVESD Countermine Prototype Systems Laboratory - Ft. Belvoir, VA

NVESD Countermine Systems Laboratory (CMSL) - Ft. Belvoir, VA

NVESD Electronics and Glass Laboratories - Ft. Belvoir, VA

NVESD Humanitarian Demining Laboratory - Ft. Belvoir, VA

NVESD Image Evaluation Facility - Ft. Belvoir, VA

NVESD Imaging Technology Environmental Test Facility - Ft. Belvoir, VA

NVESD Laser Test Tunnel - Ft. Belvoir, VA

NVESD Optical Improvement Laboratory - Ft. Belvoir, VA

NVESD Processor Development Laboratory - Ft. Belvoir, VA

NVESD Readout Integrated Circuit (ROIC) Laboratory - Ft. Belvoir, VA

NVESD X-Ray Diffraction Analytical Laboratory - Ft. Belvoir, VA

NVESD Molecular Beam Epitaxy (MBE) Development Laboratory - Ft. Belvoir, VA

NVESD System Engineering, Analysis, and Integration Laboratory (SEAIL) - Ft. Belvoir, VA

S&TCD Mobile Networking Laboratory

S&TCD Terrestrial Personal Communications Systems (PCS) Laboratory

S&TCD Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC) and Antennas Laboratory

S&TCD Advanced Internet Protocol Version 6 Research Laboratory

S&TCD Joint Tactical Radio System (JTRS) Integration and Cosite Laboratory (JICL)

S&TCD Antenna Test and Validation Laboratory

S&TCD JTRS Army Center of Excellence Lab (JACEL)

S&TCD Cryptographic Modernization Laboratory

S&TCD Infosphere Laboratory

S&TCD IPv6 and IP-Sec Laboratory

S&TCD Antenna Modeling & Simulation Laboratory

S&TCD System Engineering, Architecture and Modeling & Simulation (SEAMS) Laboratory

S&TCD Communications System Design Center (CSDC)

S&TCD Network Operations (NETOPS)

S&TCD Joint Satellite Communications (SATCOM) Engineering Center (JSEC)

S&TCD Advanced Network Laboratory

S&TCD Subterranean Communications Networks Laboratory

S&TCD Dismounted Soldier and Unattended Sensors and Munitions Networked Communication Laboratory

PARTNERSHIPS

Cooperative Research and Development |Agreements (CRADAs)

BAE Systems
Upgrade of EW Systems

BAE Systems
Antenna modeling and simulation - Appendix B - Combat ID and situational understanding; Appendix C - Testing and evaluation support for the BAE C4ISR radio

Boeing
FCS C4ISR software Integration and Verification (IV) testing and experimentation

The Boeing Company Integrated Defense Systems (IDS)
Stimulation of the function of the Tactical Unattended Ground Sensors (T-UGS) and simulation of the functionality of sensors for the FCS program

Coherent Systems International Corp.
RF and acoustic sensor integration

Cubic Defense
nvestigation of compact pulsed fiber laser technologies

DRS Infrared Technologies LP
Improved materials for high operating temperature HgCdTe infrared detectors

DRS Optronics Incorporated
Image Processing and Algorithms

Electro-Radiation, Inc. (A Honeywell International Company)
Cooperative GPS anti-jam technology

Emagin Corporation
Development, evaluation, and characterization of Active Matrix Organic Light Emitting Diode (AMOLED)

EnerSys Energy Products, Inc.
Development and testing of lithium ion batteries

Ericsson, Inc.
Evaluation of Universal Mobile Telecommunications System (UMTS) technology

General Dynamics
C4ISR Development, Integration and Technology Transfer - Task 4, SATCOM on-the-move collaboration; Task 6, Network and spectrum management systems support

General Dynamics Armament and Technical Products (was INTELLITEC)
Design, fabrication and test of small UAV chemical sensor system

General Dynamics Land Systems, Inc.
Optimized camouflage

Global Protocols, Inc.
Advanced protocol testing for internet protocols over satellite (IPoS) and multilink networks

InCode Telecom Group
Wireless technology initiatives for military applications

Inmarsat LTD
Broadband Global Area Network (BGAN) collaboration

Interstate Electronics Corp./L3 Comm.
Approaches for integration of navigation sensor data

ITT Corporation
Communication and network technology

ITT Industries Space Systems, LLC
Study to improve the fidelity of target tracking

JANUS Research Corporation
Unit of Action Maneuver Battle Lab experimentation support (integration of network planner, communication effects simulator, and network visualizer)

Kaiser Electronics (at Rockwell Collins)
Near eye displays testing technology and performance

L3 Communications/Interstate Electronics Corp.
Decentralized approaches for optimal integration of navigation sensor data battlespace

Lockheed Martin Advanced Technology Labs
Development of antenna modeling library for analysis of ad-hoc mobile wireless networks

Lucent Technologies Inc.
Nanotechnology for communications

Modine Manufacturing Co.
Carbon dioxide environmental control unit study

Modus Operandi
PC geo-location for maritime security

New Jersey Department of Treasury, Division **of Purchase & Property, on Behalf of the Office** of Information
Intrusion detection system for the State of NJ

New Jersey Network
Use of digital public television broadcast and datacast technology in support of the NJ First Responder and Emergency Management communities to enhance Homeland Security needs

New York City Fire Department
Testing of First Responder communications equipment for nuclear survivability

Nokia
Evaluation of personal communication services and advanced wireless communications networking protocols

Northrup Grumman
C4ISR technology integration, prototyping and transition - Task 1, C4ISR Homeland Defense/Homeland SecurityNetwork planning

OMNIVision Technologies, Inc.
Wavefront coding technique for uncooled Focal Plane Arrays (FPAs)

ONTAR Corporation
Electro-Optical performance models

Port Authority of NY and NJ
Technology development and concept definition for the Systems Engineering Assistance Program (SEAP)

Qualcomm
Cooperative Center of Excellence to conduct tests, demonstrations, experiments and exploratory interchange efforts

Raytheon
Investigation and evaluation of existing communications systems and research and development of new communications systems

Improvement of stability of Vanadium Oxides

Raytheon Infrared
Advanced development of HgCdTe Molecular Beam Epitaxy (MBE) growth and processing technology

Rex Systems Inc.
First responder communications and electronics improvement to weapons of mass destruction hazard marking set

Rockwell Science Center
Suitability of Electron Cyclotron Resonance (ECR) plasmas for fabricating two-color HgCdTe device structures

Rutgers University
Investigation of advanced battery materials

Stevens Institute of Technology
Photonics and microwave devices and systems for C3

Systems Documentation, Inc.
C4ISR technology integration, prototyping, and transition

Telcordia Technologies, Inc.
Anechoic chamber

Thales-Raytheon Systems Company LLC
FIREFINDER Radar Miltope modifications

University of Pittsburgh
Study of human behavioral and physiological measures and sensor imagery

Vitronics
Rapid prototyping methods, tools and candidate applications

Contracts and Other Vehicles with Academia

Bucknell
Signals intelligence research

Drexel University
Communications technologies, perimeter and port security applications

Development of autonomous mine detection algorithms for ground penetrating radar and metal detection sensors

George Mason University
Precision mine neutralization algorithms

Georgia Institute of Technology

Development of seismic accelerometer arrays

Investigation of technology to mitigate adverse effects of disruptions of networks

Johns Hopkins
Multi-Role Tactical Common Data Link (MR TCDL)

Lehigh University

Investigation of technology to mitigate adverse effects of disruptions of networks

New Jersey Inst Technology
Signals intelligence research

Northeastern University
Modeling of the interaction between ultrasonic waves reflecting off of soil surfaces

Ohio State University
Sensor-performance technology models

Penn State University
Investigation of metamaterials for antennas

Single wavelength and multi-spectral man-worn and vehicle based systems

Princeton University
Signals intelligence research

Rutgers University
Contextual reasoning

Stevens Institute of Technology
Nonlinear signal processing techniques

Signals processing technologies

University of Florida
Applications of ground penetrating radar, acoustic sensors and forward-looking infrared sensors and the fusion of those sensors for detection of tripwires, impromptu explosive devices and landmines

University of Illinois
Investigation of technology to mitigate adverse effects of disruptions of networks

University of Massachusetts
Data fusion technology

University of Mississippi
Landmine detection using multiple laser beam vibrometers

University of Missouri
Development of features for discrimination of landmines from clutter

University of Puerto Rico at Mayaguez
Sensor technology for mine detection

Villanova University
Investigation of wireless broadband technologies

Contracts and Other Vehicles with Federally Funded Research and Development Centers (FFRDCs)

MITRE
Consultative technical and engineering expertise for intelligence and information warfare data fusion and communications systems

Interagency Cooperative Efforts

DoD/OSD
Advanced sensor electronics development for demining, cave and urban assault, automated improvised explosive device (IED) change detection and digital fusion

DoD/Defense Advanced Research Projects Agency (DARPA)
Advanced electronics and networking, laser designator and radar R&D

DoD/Defense Threat Reduction Agency
Analysis and mitigation of consequences of Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) events

DoD/Defense Information Systems Agency
Homeland Security/defense technical collaboration

Air Force/JTRS AMF
Technology Maturity Assessment (TMA) of JTRS AMF (Airborne, Maritime, Fixed) to develop independent radio architectures and technical specifications

Air Force/Research Laboratory
Multispectral Database (MsDB) development and support

Army/Armament Research and Development Center
Precision Mine Neutralization Initiative

Army/Aviation Technical Test Center
Framework for expanded collaborative modeling and simulation activities

Army/Battle Command Battle Laboratory (Gordon)
Integrity of Battle Lab Federation experiments and the Battle Laboratories Collaborative Simulation Environment Infrastructure Connectivity

Army/Communications-Electronics Life Cycle Management Command
Logistics support and software architecture and engineering, networking and wireless technology

Army/Corps of Engineers
Security engineering and protective design efforts to protect critical infrastructure against terrorist acts

Army/Engineer Research and Development Center
Innovative Countermine Initiative

Army/PEO-Soldier and NATICK Soldier Center
Multispectral Adaptive Networked Tactical Imaging System (MANTIS) technologies

Army/Redstone Technical Test Center
Multispectral Database (MsDB) development and support

Army/Small Computer Program (ASCP)
Oracle software support

Army/TRADOC Analysis Center-WSMR
Science and target acquisition modeling and simulation for use in combat and sensor development

Navy/JTRS AMF
Technology Maturity Assessment (TMA) of JTRS AMF (Airborne, Maritime, Fixed) to develop independent radio architectures and technical specifications

Navy/Naval Undersea Warfare Center
Homeland security/defense technical collaboration

Navy/Office of Naval Research
Countermine

Marines
M1A1 Firepower Enhancement Program, Eyesafe Laser Rangefinder, Upgrade of M1A1 Commanders Weapon Station

Dept of Justice
Advanced forward looking infrared technology

Dept of Homeland Security/Advanced Research Projects Agency
Airborne sensors evaluations/recommendations for Customs Air Marine Operations (AMO)

Dept. of Homeland Security/Region II, Emergency Preparedness Response Directorate
Continuity of operations at Fort Monmouth, NJ and support of co-loacated Regional Operations Center

Dept. of Homeland Security/Transportation Security Laboratory
Homeland security/dense technical collaboration

Topographic Engineering Center
Spectral sensing technology

Missile Defense Agency
Advanced longwave focal plane array research

US Special Operations Command (USSOCOM) - BUSTER Unmanned Aerial Vehicle System

International Cooperative Efforts

Australia
Aircraft survivability

Landmine detection technologies

Canada
Electro-optic sensor systems

Denmark
Near-term battlefield identification systems

France
Counterbarrier warfare

Fuel cells and batteries

Intelligence, surveillance, reconnaissance systems

Lasers

Near-term battlefield identification systems

Tactical communications

Tactical Information Systems for Ground Forces

Germany
Automatic target recognition assessment

Battlefield C3 systems

C3 and information systems

Combat net radio

Countermine warfare technology

Energy conversion devices

Laser illumination

Optical fire control

Simulation and C2 information systems connectivity experiments (SINCE)

Tactical communications systems

Israel
Army engineering

Electronic warfare

Human and machine search target acquisition

Radar systems

Italy
Near-term battlefield identification systems

Japan
Countermine R&D and systems

Korea
C3 and intelligence systems

Netherlands
Countermine technology

Sweden
Communications, command and control technologies

Night vision and electronic warfare issues

Power sources

Digital modeling and simulation of intelligence, surveillance and reconnaissance (ISR), survivability and battlefield combat identification sensor systems and technologies

United Kingdom
Countermine capabilities for medium/future forces

Defensive Aides System (DAS)

Military imaging

Power sources

Universal modem (UM) production

Edgewood Chemical Biological Center (ECBC)

Edgewood Chemical Biological Center (ECBC)

Aberdeen Proving Ground, MD 21010

Mission

ECBC is the nation's principal research, development and engineering center for non-medical chemical and biological defense. ECBC develops technology in the areas of detection, protection and decontamination and provides support over the entire lifecycle - from basic research through technology development, engineering design, equipment evaluation, product support, sustainment, field operations and disposal.

History

Since the first wide-scale use of chemical weapons in World War I, scientists at Edgewood Chemical Biological Center have been researching and developing defensive technologies to protect the Warfighter from a chemical or biological battlefield threat. Over the past 10 years, that long history in chemical and biological defense was also put to use protecting the homeland. Today, ECBC researchers and engineers partner with the brightest minds in industry to develop technology that not only protects the warfighter, but also helps our nation fight the war on terrorism at home.

Installation Overview

Aberdeen Proving Ground (APG), the Army's oldest active proving ground, was established on October 20, 1917 to provide the military a facility where design and testing of ordnance materiel could be carried out in close proximity to the nation's industrial and shipping centers. The post officially opened on December 14, 1917.

APG occupies more than 72,500 acres in Harford County, Md. Its northernmost point is marked by the confluence of the Susquehanna River and the Chesapeake Bay. On the south it is bordered by the Gunpowder River. The installation comprises two principal areas separated by the Bush River. The northern area is known as the Aberdeen Area, and the southern sector, formerly Edgewood Arsenal (established in November, 1917 - as a chemical weapons research, development and testing facility), is the Edgewood Area. The two areas were administratively combined in 1971. APG property not attached to the main installation includes the Churchville Test Site in Harford County and Carroll Island and Graces Quarters in Baltimore County.

Aberdeen Proving Ground is home to 66 tenants and a host of satellite activities. Among the major tenants are the Research, Development and Engineering Command, Edgewood Chemical Biological Center, Army Research Laboratory, Developmental Test Command, Aberdeen Test Center, Center for Health Promotion and Preventive Medicine and Medical Research Institute of Chemical Defense.

As a center for Army materiel testing, laboratory research and military training, APG is a key element in the nation's defense.

Contact Information

Edgewood Chemical Biological Center
AMSRD-ECB-AP-B/Michel E3330
5183 Black Hawk RD
APG, MD 21010-5424
(410) 436-3610
http://www.ecbc.army.mil/index.htm

Major Equipment/Facilities

Advanced Chemistry Laboratory (ACL)

The ACL is the nation's newest and most advanced chemical research facility. The laboratory has been specifically engineered for work with the world's most super toxic materials and will enhance ECBC's ability to counter the evolving threat of chemical warfare and the use of chemical agents by terrorists. It features lab space and administration and laboratory support areas.

Standoff Detection Evaluation Technology Facility

For the first time ever, precise performance measurement of standoff detection systems can be made. This facility's vortex chamber utilizes a curtain of air to contain a material cloud. Also know as the Vortex Chamber, it is a BL-1 rated chamber shaped as a radially elongated cylinder with view ports. Wet or dry aerosols can be generated depending on need. The chamber can be operated in a closed or open-window configuration.

Hazardous Material Testing Chambers

The ECBC maintains two toxic and explosive material test facilities. Both facilities have chambers equipped with filter systems with an air change approximately every three minutes maintaining the chambers under negative pressure, uniquely designed for total containment in the testing of chemical (military and industrial) related equipment, and explosive/toxic munitions/materials. Chemical warfare agents and explosives may be tested simultaneously. An on-site surety lab is equipped with GC/MS, HPLC, Dynatherm, and wet-lab capabilities to perform agent analysis to RDTE drinking standards.

Protection Factor Facility (PFF)

The PFF is designed for use in evaluating the performance of new respirators and chemical protective clothing ensembles. Facility personnel are trained to set up protocols and perform fit factor testing with high tech equipment. In order to simulate exposure to chemical agents, volunteers don test items and enter a test chamber containing a polydispersed corn oil aerosol challenge. The air inside the protective equipment is sampled for challenge aerosol particles while the subject undergoes a series of exercises intended to evaluate worst-case operational conditions.

Water Test Loop System

The Water Test Loop System (WTLS) allows research relating to the contamination of water supply systems with chemical and biological warfare agents. The original design, modifications and construction of the WTLS was a collaborative effort between the U.S. Environmental Protection Agency (EPA), the U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL), and the U.S. Army Edgewood Chemical Biological Center (ECBC). The WTLS objective was to develop a simulated water destruction system and then conduct chemical and biological warfare agent experiments in that environment.

Aerosol Countermeasures Chamber

This is a large static chamber for disseminating biological (biosafety level 1) and chemical simulant aerosols. The purpose of disseminating these biological and chemical simulants is to determine the ability of a countermeasure to knock it down or kill a cloud of chemical aerosol or biological simulants in a specified time. The chamber is constructed of polycarbonate sheets that are connected together by aluminum framing, all of which is supported by steel framing.

Static Challenge Test Chamber

The chamber is used to conduct static vapor challenge tests of Nuclear, Biological and Chemical protection equipment. Shelters, vehicles, protective clothing and heating, ventilation and air conditioning systems are tested to determine the protection factor that they offer when exposed to the required standard simulant vapor dosage. The chamber operates under negative pressure and provides a controlled environment for simulant challenge testing.

Man-In-Simulant Testing (MIST) Chamber

The MIST is used to evaluate the performance of personal protection equipment. Participants don test ensembles, enter the static challenge chamber and perform representative mission tasks/exercises while being exposed to a controlled concentration of mustard agent simulant vapor. Passive Sampling Devices (PSD's) are used to measure the concentration of simulant that enters into the ensemble throughout the test period. The PSD's are analyzed using gas chromatography and a protection factor is determined by comparing the ratio of vapor dosages received at the skin with protection and without protection.

Physical Evaluation and Metrology Laboratory

The Physical Evaluation and Metrology Laboratory provides dimensional measurement, physical evaluation and investigative inspection services in support of product first article, acceptance, production and surveillance. The laboratory is equipped with a wide variety of test equipment including: an optical comparator to measure contours, surfaces, angles and radiuses; a Nikon Measuring Microscope capable of measuring in the x, y and z direction; a Profilometer to gauge the quality of a surface; and a Rockwell Hardness Tester and Micro Hardness Tester to evaluate the hardness of various metals and plastics.

Gas and High Efficiency Particulate Air (HEPA) Filter Testing Laboratory

This laboratory performs a wide range of gas and HEPA filter testing supporting DoD, DoE and commercial applications. Testing conducted includes filter production, acceptance, stockpile and surveillance. Gas filters are destructively evaluated for nerve agent and mustard life using a dimethylmethylphosphoneate simulant challenge. HEPA filters are nondestructively evaluated for aerosol efficiency using Durasyn 164 aerosol challenge. Test personnel are equipped with fixed-site and mobile test equipment to perform both in-house and off-site filter testing.

Mask and Mask Filter Testing Laboratory

The Mask and Mask Filter Testing Laboratory conducts visual inspection and performance testing of masks and mask filters. The laboratory has the capability to conduct filter and mask aerosol particulate penetration tests and to measure filter airflow resistance. Mask test capabilities consist of inhalation and exhalation resistance, microphone electrical continuity, drink train leakage and drink-tube-resistance challenges. The facility supports the evaluation of the aging effects of adverse environmental conditions to include temperature cycles, high ozone concentrations and simulated sun exposure.

Aerosol Science Facilities

Our aerosol science lab has an array of experimental capabilities and personnel expertise to perform basic and applied aerosol research. Test facilities include several large aerosol test chambers and aerosol wind tunnels to produce a wide range of very controlled aerosol environments. The facilities and labs are supplied with sophisticated aerosol characterizing equipment and instrumentation, data logging capabilities, chemical and biological hoods and sample preparation areas. These facilities are applied to a spectrum of aerosol science from basic aerosol experimentation to performance characterization of prototype and commercial aerosol collection/detection systems.

Capabilities at a Glance

Advanced Chemistry Laboratory (ACL)

Standoff Detection Evaluation Technology Facility

Hazardous Material Testing Chambers

Protection Factor Facility (PFF)

Water Test Loop System

Aerosol Countermeasures Chamber

Static Challenge Test Chamber

Man-In-Simulant Testing (MIST) Chamber

Physical Evaluation and Metrology Laboratory

Gas and High Efficiency Particulate Air (HEPA) Filter Testing Laboratory

Mask and Mask Filter Testing Laboratory

Aerosol Science Facilities

Partnerships

AAI Corporation
AC Birox,LLC(formerly CBTEK)
Advanced Analytical Technologies, Inc
ADVNT Biotechnologies, Inc
Air Cleaning Technologies, Inc
Air Techs Intl
Alion S&T Corporation
American Technology Corporation
Anachemia Canada Inc
ANP Technologies, Inc
APG Garrison
Armed Forces Institute of Pathology
ATK D-tect Systems
Auburn University
AVOX Systems Inc
Battelle Mem Inst/Aberdeen Ops
BioFactura, Inc
Bruker Optics, Inc
Camfil Farr
CBIAC
CDC/NIOSH/NIST
CH2M Hill
Chemical Security Analysis Center (CSAC)
COE/ERDC
Connectec Company, Inc
CryoStorage Services & Technologies
DHS-HSARPA
Direct Dimensions
DTRA
EAI Corporation
Eastern Canvas Products, Inc
ECBC-APG-Kirk
EPA
ERDC-CERL/HACH HST
FBI
Federal Reserve Board
Fibertek, Inc
Flanders/CSC Corporation
Flexfab LLC
GE Infrastructure Security
Genencor International, Inc
General Dynamics Amphibious Systems
General Dynamics Armt & Tech Products
General Dynamics Land Systems
Gentex Corp
GEOMET Technologies, LLC
GermFree-Purified
Hach Ultra Analytics
Herbert Cooper Company, Inc
Honeywell Kansas City Plant
Hunter Manufacturing Company
ILC Dover, Inc
Integrated Nano-Technologies, LLC
IQuum, Inc
ITT Industries Adv Engr & Sci Div
JHU/Bloomberg School of Health
John Romanowski and Associates, Inc
Johns Hopkins Univ Applied Physics Lab
Key Technologies
Lentigen Corporation
Menon Associates, Inc
Meso Scale Diagnostics, LLC
MesoSystems
Microsensor Systems, Inc
Mine Safety Appliances Co
New Horizons Diagnostics
NIST/OLES
Norcross Safety Products
North Safety Products
North Safety Products
OptiMetrics, Inc
Orbital Sci Corp/Hamilton Sundstrand
Pappas Assoc Intl, Inc.(formerly VDSC)
Parsons Infrastructure & Tech Group, Inc
Pentagon Force Protection Agency
PHA Environmental Restoration, Inc

Production Products Mfg. & Sales, Inc

Protonex Technology Corporation

Purified microEnvironments, Inc

QuickSilver Analytics, Inc

RAMSAFE Technologies, LLC

Rsch Triangle Institute Intl

RSE Incorporated

Rubicon Laboratory, Inc

SAIC

SAIC (formerly GEO-CENTERS, INC.)

Saint Louis University

Sceptor Industries Inc

Smiths Detection - Edgewood, Inc

Southwest Research Institute

STE, Inc. (formerly STERIS Corp)

Stedfast, Inc

SURVIVAIR

TriMech Solutions

TSI Incorporated

U.S. Army 22nd CM BN (TE)

U.S. Postal Service

Univ of MD, Baltimore (UMB)

USAMRIID-Special Immunization Program

USDA APHIS & FSIS

ZUMRO, Inc

RDECOM

Natick Soldier Research, Development and Engineering Center (NSRDEC)

US ARMY NATICK SOLDIER RD&E CENTER

Natick Soldier Research, Development and Engineering Center (NSRDEC)

Natick, MA 01760

Mission

To maximize the Warrior's survivability, sustainability, mobility, combat effectiveness and quality of life through basic and applied research, technology development and demonstration and engineering of rations, food service equipment, combat clothing and individual equipment, shelters, airdrop systems and organizational equipment. Provide the necessary RD&E to integrate the technologies for combat-essential elements of command and control, survivability, lethality, sustainability and mobility into the Soldier system. Perform a similar function to integrate technologies for Soldier support systems and for Warrior systems and Warrior support systems for other services and agencies.

History

The Natick Soldier RDEC is the lead U.S. Military laboratory to maximize the individual Warrior's Survivability, Sustainability, Mobility, Combat Effectiveness and Quality of Life by treating the Warrior as a System. NSC has served in this role for the United States since 1952. NSRDEC was established after World War II as a result of the harsh lessons learned by our forces. We are ensuring America's Warfighters will be the best protected and equipped Warrior on any modern-day battlefield.

Installation Overview

Located just 17 miles west of Boston, the Natick Soldier RDEC has unique access to many world-renowned universities and research hospitals. Also, the region is home to many technology-based, private-sector companies focused on biotechnology, information technology, nanotechnology, etc., providing additional opportunities for the NSRDEC research and development teams to network and share technology. By embracing these partnering opportunities both within the NSC, Soldier Systems Center (SSC) community and with nearby academic, industry, and governmental agencies, the NSRDEC team has consistently delivered state-of-the-art products to our Warfighters for the past 50 years.

Contact Information

Public Affairs Office
Natick, MA 01760-5012
(508) 233-4300
http://www.natick.army.mil/soldier/index.htm

Major Equipment/Facilities

Advanced Food Processing Laboratory

This lab includes equipment for the production and testing of food/food components to facilitate state-of-the-art ration development. Production equipment, all pilot-plant-scale, includes: meat processing chamber, starch research and baking area, steam retorts, continuous processor/sealer system for packaging tube foods, Rheon encruster, pressurized microwave oven, freeze dryer, microwave-assisted freeze dryer, extruder for bar production, impingement oven, dough sheeter, All-Fill piston filler and food-yield quantifier. Also, High Pressure Processing Unit, Pulsed Electric Field Unit, Analytical Microbiology lab, Microwave Digestive System, and Ohmic Heating Unit.

Doriot Climatic Chambers

The Doriot Climatic Chambers is a one-of-a-kind, human-rated research facility that is used to assess the limitations of human performance under various conditions, to conduct research on the physiological impact of new equipment on soldiers, to evaluate the effectiveness of soldier equipment in development and to test other equipment used by soldiers in various environmental conditions. The facility is primarily used by the Natick Soldier RDEC, US Army Research Institute of Environmental Medicine, Product Manager-Force Sustainment Systems and Product Manager-Clothing and Individual Equipment.

Flexible Packaging Laboratory

Specialized equipment can be used as follows: mimic the shock and vibration a package endures during shipping and handling; fabricate and fill packages on-line to simulate commercial production runs; and test how well packaging materials or packages perform in environmental extremes such as desert, arctic or jungle conditions, using the packaging environmental chambers. Equipment consists of: metal tray can sealer/polymeric sealer, vacuum/gas flush heat sealer, pouch maker, vibration table, environmental chambers, drop tester, horizontal form-fill-seal machine, compression tester, and two twin screw extruders for plastic compounding and film processing.

Food Analysis Laboratory

This lab includes equipment for the chemical, physical, structural and textural characterization of food/food components and chemical heating technologies to facilitate state-of-the-art ration development. The Analytical Equipment includes: Laser Scanning Confocal Microscope, Thermal Analysis Equipment (DSC, DMA), Time Domain NMR, Fluorimeter, Moisture Analyzer, Colorimeter, Solution Calorimeter, Chromatography (HPLC), Rapid Scanning UV/VIS and PDA Spectrophotometers, LC/GC/MALDI-TOF Mass Spectrometers, Glucometer, Texture Analyzer, Image Analyzer, Rheoviscometer, Protein Analyzer, Supercritical Fluid Fat Extractor, osmometer, headspace detector, pH and Aw meters.

Packaging Materials Testing Laboratory

The test equipment measures: the force needed to break a material or a package seal or the rate that moisture and/or oxygen passes through a package or material. Specialized equipment consists of: Instron tensile strength/seal strength tester, Mocon water vapor transmission tester, Mocon oxygen transmission tester, headspace gas analyzer and pouch/tray burst testers.

Coextruder

The coextruder is used for incorporation of nano-clays into commercial polymers used in commercial packaging polymers (e.g., polyethylene, polypropylene) in support of Nanotechnology efforts. The lab scale unit is used for studying various production parameters (e.g., screw speed and processing temperature).

Burner Test Facility

The facility is used to test and evaluate diesel-fired combustion systems including burners, military kitchen appliances, camping stoves, pocket stoves, water heaters, shelter heaters and heat-driven generators and cogenerators. Combustion efficiency, heat transfer and energy balance are determined to reconcile total energy in, to total energy out. Assessments of safety, health, ergonomics, maintenance and reliability are also made. Specialized test equipment includes thermal imagers, combustion gas analyzers, electric power consumption, ultrasonic flow meter and mass spectrometer.

Food Safety Testing Laboratory

The Food Safety Testing Laboratory was established in FY03 and became fully functional in FY04. Research and Development will include developing screening assays, testing/modifying biosensor equipment and optimizing food safety testing protocols for the military and for civilian sector applications. The laboratory is a Biosafety Level 2 Plus (BSL 2+) laboratory and has several built-in safety features which will allow our research personnel to work safely with the pathogens. Analytical tests to validate the methods and instruments that the Army has selected for detection of pathogens and biological agents in foods will also be conducted. These pathogens and agents have been designated by the Department of Defense and the Center for Disease Control as likely candidates to be used as biological weapons. No live agent testing will be conducted in this laboratory. Diagnostic testing of equipment with various foods and optimizing the protocols for these tests will be conducted in the BSL II plus lab.

Refrigeration Calorimeter Test Chamber

This chamber is used for the test and evaluation of refrigeration equipment. It has super insulated walls, fans for air circulation, an array of thermostatically controlled heaters to provide a controlled interior ambient temperature and a fire suppression system. State-of-the-art data acquisition capability includes temperature data and an energy analyzer. Work has included performance testing of various refrigeration systems and long-term testing of shipboard ice making equipment for the Navy.

Navy Test Laboratory

This facility is used for testing and evaluation of Navy galley food service equipment.

Future Force Warrior (FFW) Systems Integration Laboratory (SIL)

The Future Force Warrior (FFW) Systems Integration Laboratory provides a dedicated lab environment for the rapid design, development and evaluation of advanced Soldier equipment prototypes and components. Current equipment can be modified, and new equipment designed and rapidly prototyped to evaluate form, fit and function of innovative and proposed Soldier system concepts. Testing and analysis tools are employed to assess aspects of system/component performance prior to more rigorous assessments in field environments.

The Textile Performance Testing Facility

The Textile Performance Testing Facility has been renovated to comply with standard requirements of Quality Management Systems ISO 9001:2000 and ISO 17025:1999. The facility consists of a Shade Evaluation Facility and a Textile Testing Lab. Textile-based materials are tested to provide technical support to the multiple customers. Digital color acceptability criteria is established for procuring military items and quality prototypes.

Fiber Production and Research Facilities

Fiber Plant capabilities include an experimental size and pilot production monofilament fiber spinning unit. The Fiber Research Facility has separate state-of-the-art research and production multicomponent fiber spinning capabilities. The Bureau of Engraving and Printing (BEP) has authorized and funded an optics and synthesis laboratory. The facility will be located at NSC for use in investigating new products to be used by BEP and the Soldier. The synthesis laboratory is functional and the optical facility is in the planning stages. The facility has recertified with the International Organization for Standardization Certification (ISO 9001:2000) from National Quality Assurance for the design and manufacture of synthetic fibers and materials.

Computer-Aided Design (CAD) & Rapid Prototyping Facility

The Rapid Prototype System will produce precise, solid 3-D objects of unlimited geometric complexities directly from Computer-Aided Design Data. Prototypes can be built from several materials to include laminated paper, nylon, glass filled nylon and an elastomer. Larger parts can be produced in sections and then fastened together. Functional prototypes of unlimited geometric complexity can be produced with tolerances of +0.002 inches and with the structural integrity adequate to evaluate function in many cases. This facility has supported various customers to include Army, SOF, industry and academia.

Clothing and Equipment Design and Prototype Facility

The Clothing and Equipment Design and Prototype Facility has the capability to design and fabricate end-item clothing prototypes such as ballistic and chemical protection, combat and dress clothing. These prototypes allow for initial fit/wear tests and assist in the preparation of technical data packages for large-scale procurement. The Computer Aided Design (CAD) apparel design system allows for pattern input, lifetime storage, graded sizing, updates and modifications. These patterns can be sent electronically directly to the contractor or printed on plotter paper, oak tag or on compact disk (CD).

Helium-powered Ballistic Test Apparatus

The Helium-powered Ballistic Test Apparatus is a research device for the initial assessment of new materials and is used for fragmentation testing of yarns, fabric or laminate samples primarily. The device shoots a .22 caliber fragment simulating projectile at low to moderate velocity. It provides researchers and manufacturers information to gauge the potential ballistic performance of these items early in the production or pre-production phase.

Clothing and Individual Equipment Fightability Course

This course is a tool used for the evaluation of combat equipment. It is an obstacle course designed to measure the effects of equipment on a Soldier's mobility, agility and speed in a combat environment. The course includes nine outdoor obstacles and a two-story building with stairs, doorways, windows and halls for evaluation of Military Operations in Urban Terrain (MOUT). Each obstacle is equipped with electronic timing devices for measuring Soldier performance.

Roller Test Facility

The Roller Test Facility simulates a C-17, C-130J and C130H aircraft roller bed. It has 160 instrumented rollers that are able to measure point loading of cargo within an airdrop aircraft. It has an overhead lift capability which consists of two gantry cranes, each gantry having two instrumented lifting hooks. Each hook has a 7.5 ton capability. In addition, the Roller Test Facility is also equipped to simulate up to 80,000 pounds of parachute-extraction force.

45-Foot High Drop Tower

The tower is available for the lifting and releasing of instrumented airdrop loads up to 100,000 pounds. The Drop Tower is used to simulate the impact shocks that are exerted on parachute loads when they impact the ground.

550,000-Pound Capacity Servo-Hydraulic Type Tensile/Compression Machine

The tensile compression machine applies controlled tensile/compressive loading to objects while measuring force and linear displacement. This machine provides uniform forces/displacement throughout its 20-inch stroke and provides the capability to apply load or displacement in monotonic or cyclic-control commands.

112,000-Pound Capacity Screw Type Tensile/ Compression Machine

This tensile compression machine applies controlled tensile/compressive loads to objects while measuring the force and displacement. This machine provides uniform displacement throughout its nine-foot stroke.

Microclimate Conditioning Laboratory

The Microclimate Conditioning Laboratory at NSRDEC is used for test and evaluation (T&E) as well as developmental programs. The T&E capabilities focus on the characterization of the thermal and fluid flow performance of microclimate cooling and heating systems and garments, as well as determining system power requirements. The lab is also used to conduct collaborative work with industrial and academic partners to develop enhanced and new microclimate conditioning systems and components.

Mechanical Prototype Fabrication Facility

The facility employs highly qualified Model Makers (metal, wood, plastics), Instrument Makers, Machinists, Plastic Mold Makers, Sheet Metal Mechanics, Welders and Electricians to fabricate and aid in the design and construction of full or scale-model prototype projects and displays. Prototypes can be produced individually or in small lots. Computerized equipment assures precision and repeatability. Travel to test sites as needed to assist with setup and operation of prototypes.

The Biomechanics Laboratory

The Biomechanics Laboratory is unique in DoD. The joint NSRDEC/USARIEM research program in biomechanics studies forces in and on the human body, and the effects produced by those forces. It consists of a 7,500 square-foot dedicated laboratory outfitted with state-of-the-art equipment for three-dimensional analysis of human movement, measurement of external forces on the body, monitoring of muscle activity and real-time mapping of pressure patterns associated with wear of clothing and equipment.

Three-Dimensional Anthropometric Laboratory

A Cyberware laser-based optical digitizing system records the 3-D surface coordinates of the head and face of U.S. Army Soldiers, and a Cyberware 3-D anthropometric scanning system collects whole body data on approximately 95 percent of a subject's body. The ability to obtain accurate 3-D data describing human shape differs, and to apply these data in the areas of computerized design and evaluation will provide faster and more cost effective tools for developing military/non-military clothing and equipment systems.

Parachute Prototype Facility

This facility has the capability to fabricate prototype parachutes, harnesses and accessories; make modifications (such as upgrading or repairing existing fielded equipment); and provide quick-response production capabilities. The team provides technical support as required for airdrop items, Quality Deficiency Reports (QDRs) and Engineering Change Proposals (ECPs). Their work is not limited to only airdrop; however, it is their main focus.

Tentage Prototype Shop

The tentage Prototype Shop focuses on the design and prototyping of fabric structures interface kits and accessories using heat sealing, ultrasonic welding, radio frequency welding, sewing, etc.

The Modeling, Simulation and Analysis (MS&A) Center

The MS&A Center contains the necessary computer hardware and software for inserting fully outfitted dismounted warriors into distributed interactive simulations with other Research, Development and Engineering Centers. Additionally, computer software such as IUSS, JCATS, ModSAF and Janus are used for constructive analysis or main-in-the-loop virtual simulations and rendered in 3-D by the MetaVR visualization system.

Laser, Thermal and Ballistic Test Facility

The facilities capabilities include: (1) evaluation of laser eye-protection systems at numerous wavelengths, output powers and pulse widths; (2) ballistic, haze and weatherometer testing of laser and ballistic eye protection systems; and (3) complete thermal data acquisition and analysis system. A picosecond laser, a continuum pulsed Nd: YAG laser (which fires 10 ns pulses), two continuum pulsed ruby lasers (each fires 40 ns pulses), an Alexandrite tunable laser (fires 50 ns pulses), and numerous continuous-wave lasers) can produce all wavelengths necessary to test the performance of eyewear, evaluate the physical and optical properties of development materials and verify end-item compliance with American National Standards Institute (ANSI). In addition, there is a Raman Stokes Cell for frequency down conversion of pulses laser sources and a Raman Anti-stokes Cell for up conversion of pulses laser sources.

Sensory and Consumer Testing Laboratory

This laboratory conducts a wide range of studies to characterize the sensory properties of and consumer responses to foods, beverages, fabrics, clothing items and other consumer products. Additional in-house facilities include sensory panel and focus group rooms, and two environmentally controlled fabric-conditioning rooms. Trained flavor, texture and hand-feel panels are available for descriptive sensory testing. Existing human use protocols enable testing for a wide range of FDA-approved and experimental products with a large, volunteer, consumer panel.

Polymer Processing

The PRISM 16 mm twin screw compounding system, with screw speeds up to 500 rpm and heated temperature zones up to 400C, can be used to blend different polymers and nanoparticles in 10-15 g quantities. The DACA monofilament fiber spinning system can be used to take compounded polymer formulations and melt spin them into fibers. It also has the capability to wet spin fibers. The DACA mini injection molder makes test specimens that are designed for mechanical, compression and dynamic mechanical analyses. In addition, there is a Collin co-extrusion laboratory bench system to produce three or five layer multi-layer cast films.

Microscopy Laboratory

This laboratory has the capability to analyze fiber and fabric blends to aid in both research and development. The laboratory includes an Atomic Force Microscope, Laser Scanning Confocal Microscope, Scanning Electron Microscope, Environmental Scanning Electron Microscope (ESEM) and our newest acquisition: a FasTEM Transmission Electron Microscope (TEM). With these microscopes, we can look carefully at the surface and the internal structure of materials.

Chemical and Material Analysis

The Chemical and Material Analysis capabilities include a Fourier Transform Infrared Spectroscopy (FTIR) with microscope and gas chromatograph; Gas Chromatograph - Mass Spectrometer (GC-MS); GC systems with selective detectors; Multi-pump Liquid Chromatography (LC); Residual Gas Analyzer (RGA) mass spectrometer with flows down to one ml per; Thermo-mechanical analyzer; Differential scanning calorimeters; High-resolution thermo-gravimetric analyzer; Dynamic mechanical analyzer; and a Dielectric analyzer.

Biotechnology Laboratory

The Biotechnology Laboratory facility has various instruments for the synthesis and analysis of genetic material and peptides/proteins: The Class II fermentation facility; a Polymerase Chain Reaction (PCR) capability; a DNA sequencing gel system; peptide synthesizer; Advance Chemtech STORM system; Perkin Elmer Fluorimeter; Water Alliance High Performance Liquid Chromatograph (HPLC); and a Pharmacia BIAcore Processing Unit.

Camouflage Evaluation Facility/Digital Inkjet Printing Facility

This facility provides the ability to evaluate current and experimental camouflage patterns year-round. Four environmental settings are represented: desert, woodland, urban and arctic. The facility has special lighting that can be adjusted to simulate different levels of moonlit/moonless skies. Digital inkjet printing provides cutting-edge camouflage design and printing technology.

Special Purpose Shock Tube for Blast Assessment

The Special Purpose Shock Tube for Blast Assessment is a specially designed shock tube for testing fabric samples in a controlled environment. The device is being used to determine the appropriate types of sensors to be used for measuring the effects of shock waves on fabrics. This information will be used to help build an anthropometric device to be used for designing and testing blast-protective equipment.

Footwear Performance Laboratory

The Footwear Performance Laboratory provides the biomechanical and physical analyses capability for both military and commercial footwear. The laboratory contains equipment that is integral to the U.S. Army, Special Operations Command, USMC and U.S. Navy footwear programs and is used to perform research and development work as well as quality control and footwear performance evaluations. It has also been used for fee-for-service testing for private industry and engineering support for the Defense Supply Center Philadelphia.

Capabilities at a Glance

Advanced Food Processing Laboratory

Doriot Climatic Chambers

Flexible Packaging Laboratory

Food Analysis Laboratory

Packaging Materials Testing Laboratory

Coextruder

Burner Test Facility

Food Safety Testing Laboratory

Refrigeration Calorimeter Test Chamber

Navy Test Laboratory

Future Force Warrior (FFW) Systems Integration Laboratory (SIL)

The Textile Performance Testing Facility

Fiber Production and Research Facilities

Computer Aided Design (CAD) & Rapid Prototyping Facility

Clothing and Equipment Design and Prototype Facility

Helium-powered Ballistic Test Apparatus

Clothing and Individual Equipment Fightability Course

Roller Test Facility

45-Foot High Drop Tower

550,000-Pound Capacity Servo-Hydraulic Type Tensile/Compression Machine

112,000-Pound Capacity Screw Type Tensile/Compression Machine

Microclimate Conditioning Laboratory

Mechanical Prototype Fabrication Facility

The Biomechanics Laboratory

Three-Dimensional Anthropometric Laboratory

Parachute Prototype Facility

Tentage Prototype Shop

The Modeling, Simulation and Analysis (MS&A) Center

Laser, Thermal and Ballistic Test Facility

Sensory and Consumer Testing Laboratory

Polymer Processing

Microscopy Laboratory

Chemical and Material Analysis

Biotechnology Laboratory

Camouflage Evaluation Facility/Digital Inkjet Printing Facility

Special Purpose Shock Tube for Blast Assessment

Footwear Performance Laboratory

Partnerships:

Abbotsford Produce Egg Products (APEP)

AFMC/Naval Air Warfare Center/Defense Logistics Agency

Agriculture (Region One) Northern Region Army TMDE Activity

Agriculture Research Service (ARS)

Air Mobility Warfare Center

Army & Air Force Exchange Service (AAFES)

Army Engineering Laboratory

Army Personnel Agency (PERSCOM)

Atair Aerospace, Inc.

Battelle Memorial Institute

Best Harvest

Boeing

Bureau of Land Management, Alaska Fire

Campbell Soup Co.

CarbBoom

Carleton Tech.

Centec Mobile Systems (Alkan)

Clarkson University

Clemson University

Combat Development Directorate (CDD), U.S. Army Special Operations Command (USASOC)

Combat Service Support (CSS) Battle Lab (BL), Fort Lee, VA

Commonwealth of Massachusetts Executive Office of Public Safety

Compact Membrane Systems, Inc.

Corning

CTC, Inc.

D'Andrea Bros.

Danalco

Defense Advanced Research Projects Agency (DARPA)

Defense Logistics Agency (DLA)

Defense Personnel Supply Center (DPSC)

Defense Supply Center, Philadelphia

Dismounted Battlespace Battle Lab, Fort Benning, GA

Dutch Space

Edgewood Chemical Biological Center (ECBC)

Extreme Endeavors

Food Technology Services, Inc.

Foster Miller, Inc.

Fort Devens, MA

Genencor

Gentex

GenuOne

Global Secure Safety, Inc.

ILC Dover

Institute for Collaborative Biotechnologies (ICB)

Institute for Simulation & Training (IST) Aerospace

Institute for Soldier Nanotechnologies (ISN) at Massachusetts Institute of Technology (MIT)

Integrated Materiel Management Center (IMMC)/ Airdrop Delivery (ADD)

International Mountain Guides, Inc.

Johns Hopkins University

Joint Forces Command/Joint Warfighter Center

Joint Programs Management Office-Individual Protection (JPMO-IP)

Joint Readiness Training Center

Joint Readiness Training Center (JRTC)

Kaman Aerospace

Kraft

L.J. Engineering, Inc.

Lightyear Technologies

Malden Mills

Meso Scale

Military Traffic Management Command (MTMC)

Mist Mobility Integrated Systems Technologies, Inc. (MMIST)

Mitsubishi/CAREX

Mountain Warfare School

National Institute of Standards & Technologies (NIST)

National Oceanic & Atmospheric Administration (NOAA) Forecast System Lab (FSL)

National Technology Transfer Center (NTTC)-ERPT

NAV PM NSW

Naval Post Graduate School

Naval Weapons Station/Naval Packaging, Handling, Storage and Transportation (PHST) Center

Navy Clothing & Textile Research Facility (NCTRF)

Oceaneering

Office of Law Enforcement Standards (OLES)

Office of Naval Research (ONR)

Pacific International Center for High Tech Research

Pactech

Para-Flite

Paulson

Pioneer

PPG Industries

Proctor & Gamble

Product Manager (PM)-Abrams Tank System

Product Manager-Clothing & Individual Equipment (PM-CIE)

Product Manager-Force Sustainment Systems (PM-FSS)

Product Manager-Soldier Equipment (PM-SEQ)

Rhode Island Air National Guard (RIANG)

Rocky Resource Laboratory

SealTek

SJR Foods

Skyboard

SOPAKCO, Inc.

Stara

Sterling Foods, Inc.

STI, Massachusetts

Sweet Productions

Protective Group

Theater High-Altitude Area Defense (THAAD)

University of Massachusetts

TOI (PPG)

Topographic Engineering Center

Tracer Detection Technology Group

Triton

U.S. Agency for International Development (USAID)

U.S. Air Force

U.S. Air Force Research Laboratory

U.S. Army Communications & Electronics Command (CE-COM)

U.S. Army Institute for Environmental Medicine (ARIEM)/Army National Guard

U.S. Army Maneuver Support Center (MANSCEN)

U.S. Army Quartermaster School

U.S. Army Research Laboratory

U.S. Army Tank & Automotive Command (TACOM)

U.S. Military Academy

U.S. Special Operations Command (USSOCOM)

Unifi Manufacturing

University of New Hampshire (UNH)

University of South Australia

University of South Florida

Vertigo

W.L. Gore

Walter Reed/Joint Special Operations Command (JSOC)

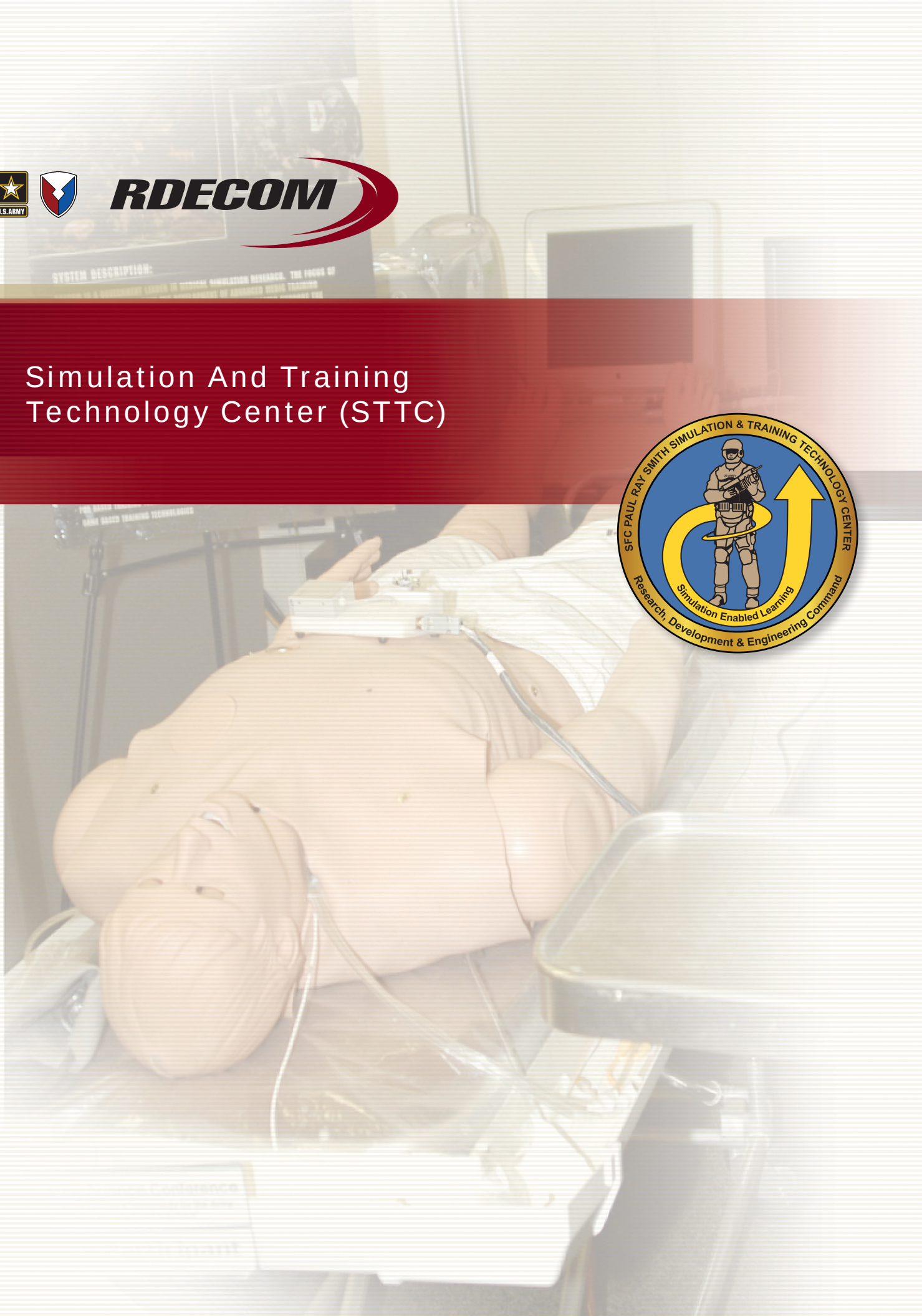
XVII Airborne Corps & Fort Bragg

Xymid

Yuma Proving Ground/Naval Post Graduate School

RDECOM

Simulation And Training Technology Center (STTC)



Simulation and Training Technology Center (STTC)

Orlando, Fla., 32826-3276

Mission

The mission of the U.S. Army Research, Development and Engineering Command Simulation Training and Technology Center is to enhance Warfighter readiness through research and development of applied simulation technologies for learning, training, testing and mission rehearsal.

To achieve this mission, the STTC established six strategic goals.

1. Focus on key competencies:

Real-Time Human-in-the-Loop Simulation Technologies

This area includes technologies that support training and mission rehearsal. It includes human, agent, and team interfaces, sensory stimulation, and tracking technologies for systems of systems approach to linked, distributed, or embedded systems.

Behavioral Representation

Artificial intelligence technologies are widespread among the STTC's missions (embedded training, medical training, agent simulations, advanced learning environments, etc.) and include computer-generated forces, intelligent tutoring systems, composable behavior technologies, and simulation management technologies.

Shared Simulation Environments

This area includes test and training environments for missions like urban operations, advanced learning, embedded training, and distributed development. It includes technologies for the rapid construction of urban environments and multielevation structures. It includes cross-domain technologies likes augmented reality and architectures and standards for distributed simulation environments.

Partnering

STTC's distinctive competence lies within our focus on partnering as a means of optimizing value. Whether it is contracting expertise or leveraging the infrastructure of the Navy, Army, Air Force or Department of Justice, STTC continually works to improve its relationship with partners located in the Central Florida area. This provides greater value to AMC RDECs, DARPA, and other users.

2. Support Training Transformation (T2):

STTC provides simulation technologies for a capabilities-based training environment for the Department of Defense in support of national security requirements. This includes Joint Knowledge Development and Distribution Capability, Joint National Training Capability and Joint Assessment and Enabling Capability.

3. Provide and maintain a state-of-the-art facility:

The STTC has a vision to provide the Department of Defense and Department of Homeland Security with state-of-the-art applied research and development of simulation technologies for knowledge and understanding human, agent, and teams in a system of systems environment. To be a national leader, the Center is constantly improving by drawing on the talent, facilities, and experience of its partners.

4. Promote the learning and growth of the Simulationist to enhance the STTC's ability to support the Department of Defense and Department of Homeland Security.

5. Optimize the financial resources provided by the Army and our Partners.

6. Develop and maintain processes to support the **most efficient and effective use of resources to provide the Warfighter with the solutions necessary** to do their mission.

History

The U.S. Army Research, Development and Engineering Command Simulation and Training Technology Center was officially reorganized in October 2003. As part of the reorganization, the STTC separated from the Simulation, Training and Instrumentation Command with 40 civilians forming the STTC while the remaining 480 civilians including 180 engineers formed the new Program Executive Office for Simulation, Training and Instrumentation. Today, the STTC reports directly to RDECOM Headquarters managing 6.1, 6.2 and 6.3 funding lines and is one of the smallest organizations in RDECOM that manages Advanced Technology Objectives for the U.S. Army.

On Nov. 7, 2004, The RDECOM-STTC located in Orlando, Fla., was named after Sgt. 1st Class Paul Ray Smith. Sgt. 1st Class Paul Ray Smith was chosen because he was a Floridian and Combat Engineer Sapper with the 11th Engineer Battalion, 3rd Infantry Division, who made the ultimate sacrifice for his country by heroic actions during Operation Iraqi Freedom. For these actions, Sgt. 1st Class Smith was awarded the first Medal of Honor since Operation Iraqi Freedom began. On May 13, 2005, the Sgt. 1st Class Paul Ray Smith STTC was rededicated to him in honor of the award.

Today, the Sgt. 1st Class Paul Ray Smith STTC is a model for collaboration by housing employees directly assigned to the STTC, but also from the U.S. Army Research Laboratory, U.S. Army Research Institute, U.S. Army Program Executive Office Simulation Training and Instrumentation, University of Central Florida/Institute for Simulation and Training, and the Central Florida industrial base.

Contact Information

Simulation and Training Technology Center
U.S. Army Research, Development and Engineering Command
ATTN: Director, AMSRD-STTC
12423 Research Parkway
Orlando, FL 32826-3276
http://www.rdecom.army.mil/STTC/index.html

Installation Overview

The US Army Simulation and Technology Training Center is the home to more than 80 personnel from several organizations including: US Army Research Laboratory, US Army Research Institute, US Naval Air Warfare Center Training System Division, US Army Program Executive Office for Simulation, Training and Instrumentation, University of Central Florida (UCF) / Institute for Simulation and Training (IST) employees, UCF students, and industry. It is a highly successful and expanding partnership with lab and office space, 19 testbeds, a simulation theater, simulation equipment, tools and network infrastructure.

The facility contains cable for data, voice and multimedia applications. Additionally, the facility has a significant number of network data and voice ports throughout the facility; Wide Area Network (WAN) access to Defense Research & Engineering Network (DREN), National Guard Network and Internet II; Distributed Simulation Testbed to support interoperability and management of STTC hardware and network assets, software assets (prototypes and models) and databases (terrain, environmental and exercise); and a simulation theater for large groups (30+) for an immersive audio and video experience.

Capabilities

Asymmetric Warfare-Virtual Training Technology (AW-VTT)
This program uses computer-based Internet simulation training or through a secure wide area network such as the Defense, Research and Engineering Network. The AW-VTT provides Soldiers with virtual experiences to improve competencies in operations against threats in simulated urban, jungle or desert environments. This program provides Soldiers the ability to train interactively with other Soldiers at home stations, in transit or in their area of responsibility. The degree of realism and the variety of realistic operational environments and threats can be tailored to represent characteristics unique to different cultures or religions. These capabilities have been used to prepare Soldiers for cultural experiences before deployment.

Combat Trauma Patient Simulator (CTPS)

This program prepares medics for upcoming deployments by treating simulated combat casualties in realistic conditions that incorporate the look, sound and smell of war. CTPS patients (dummies) breathe, generate pulse beats, bleed, secrete fluids and can "die" if given incorrect or insufficient care, thus providing realistic training to prepare medics to treat casualties in real-life scenarios including combat trauma, mass casualty situations and stabilization and Soldier and civilian evacuation. The CTPS consists of networked patient simulators that allow medics to train individually or as teams. The CTPS electronically stores the patient profile and tracks all treatment at each level of care, starting at the point of injury and throughout the casualty care cycle.

Distributed Advanced Graphics Generator and Embedded Rehearsal System (DAGGERS)

This system is a proof of concept for a dismounted embedded training system. The portable, 3-D simulation enables Soldiers to conduct realistic training and mission rehearsal. The augmented reality capabilities also have potential applications for first responder training in homeland defense, special weapons teams, law enforcement and civilian medical training.

Self-directed Learning Internet Module (SLIM)

Developed with the close cooperation of the U.S. Army's Office of the Deputy Chief of Staff for Intelligence, G-2. In SLIM training modules, trainees navigate urban terrain. Players work from a menu of actions that records their observations, allows them to check maps, takes Global Positioning System readings and even takes digital photographs. Scenarios are time-limited. Trainees prepare a report and are provided with a scored result following the simulated patrol. SLIM requires users to emphasize cognitive judgment and observational acuity to heighten awareness of elements in their surroundings while prioritizing, reporting and honing memory skills.

Virtual Integrated Military Operations in Urban Terrain Training System (V-IMTS)

This program allows Soldiers to conduct virtual training in an immersive environment using a virtual database and the OneSAF as planning and rehearsal tools in preparation for live training exercises. The simulation is designed to improve Soldier tactics, dismounted infantry training and tactical decision making of all squad members.

Global Partnerships

In addition to its in-house research and development program, STTC takes a global approach to leverage and support allied technology programs, commercial technology, other government agency programs, industry R&D and academic research to better support Soldier training capabilities. STTC is working closely with the Army Research Institute for the Behavioral and Social Sciences, the Air Force Research Lab, Defense R&D Canada and the United Kingdom's Ministry of Defense on a program to support coalition mission training through Internet-based simulation. These initiatives and partnerships will ensure that RDECOM STTC continues to provide Soldiers and leaders the most advanced simulations and training technologies that industry has to offer.

RDECOM

Tank Automotive Research, Development and Engineering Center (TARDEC)

TARDEC

Tank Automotive Research, Development and Engineering Center (TARDEC)

Warren, MI 48397-5000

Mission

To research, develop, engineer, leverage and provide advanced systems integration of technology into ground systems and support equipment throughout the life cycle.

History

In the early 1940s, the Army's 1.3 million-square-foot Detroit Arsenal was built in just seven months. The facility had a single purpose: to build quality tanks. The Army chose the site for the arsenal because of the area's wealth of automotive technology and manufacturing capability.

In 1946, the Tank Automotive Components Laboratory, now known as the Tank Automotive Research, Development and Engineering Center (TARDEC), was formed at the recommendation of a committee led by Chrysler Corporation's President K.T. Keller. This committee comprised of leading engineers from Chrysler, Continental Aviation & Engineering, Ethyl, Ford, General Motors, Hudson Motor Car, International Harvester, Packard, Studebaker and Timken Detroit Axle determined that Detroit would be an ideal location for a military automotive laboratory. The newly created Components Laboratory spawned many successful collaborative working relationships.

As part of the TARDEC organization, the National Automotive Center (NAC) is responsible for advancing this emphasis on collaboration. This is accomplished by working with private industry to leverage commercial automotive technologies for military use.

The establishment of the NAC in southeast Michigan places it among 96 major automotive research and development centers including Chrysler, Ford, General Motors, Honda, Hundai, Mazda, Nissan, Saturn, Toyota and Volkswagen. In addition to these organizations, over 85 percent of the Nation's automotive supplier technical centers are located in Michigan.

With more than 60 percent of U.S. automotive engineers living and working in Michigan, TARDEC and its NAC reside in the heart of a concentrated source of automotive intellectual property unmatched anywhere in the country.

Installation Overview

The U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) is the nation's laboratory for advanced military automotive technology. Headquartered at the Detroit Arsenal, Warren, MI, TARDEC is located in the heart of the world's automotive capitol. TARDEC's associates develop and maintain vehicles for all U.S. Armed Forces, many federal agencies and more than 60 foreign countries.

TARDEC's programs advance the state-of-the-art in power and energy, advanced collaborative environments, robotics, active protection systems, advanced armors, electric drive and embedded simulation to provide the Army with the materiel solutions it demands. We lead several Army Future Force science and technology efforts – collaborating with the Army's combat developers – to ensure we field robust equipment that meets aggressive cost, schedule and performance standards.

Making sure warfighters receive optimized equipment quickly at reduced taxpayer cost, TARDEC is at the forefront of technology transfer, building solid relationships with industry and academia to develop dual-use technologies. With a legacy of support since World War II, TARDEC is uniquely positioned to ensure that the Army remains a strategically dominant force across the operational spectrum.

Our associates are committed to increasing the Army's agility, versatility, responsiveness, deployability, lethality, sustainability and survivability—delivering Superior Technology for a Superior Army.

Contact Information

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Building 200
Warren, MI 48397-5000
http://www.tacom.army.mil/tardec/

Major Equipment/Facilities

Environmental Heat Management Chamber and Laboratory

The Environmental Heat Management Chamber and Laboratory is a unique vehicle-level thermal management evaluation facility that accommodates both tracked and wheeled platforms. Environmental conditions are controlled through proper simulation of air flow rate and temperature, solar radiation, and particular steady-state vehicle operating condition.

Steady-State Vehicle Evaluation Test Cell and Laboratory

Dynamometers are employed to test and evaluate engines, transmissions, drivelines, or total propulsion system at the vehicle or component-level assembly. The facility will accommodate a broad range of vehicle platforms from light-duty High Mobility Multi-Purpose Wheeled Vehicles (HMMWV) to main battle tank applications.

Flexible Steady-State/Transient Vehicle Evaluation Test Cell and Laboratory

This recently upgraded facility includes a double dynamometer arrangement that can simulate steering maneuvers, steady-state operation and transient operation at the vehicle level for up to a 40-ton platform or 800 BHP.

Propulsion System Component Test Cells and Laboratories

Six test cells are equipped to accommodate a variety of engine and transmission sizes. Capability includes evaluating engines from 100 BHP to 1400 BHP and transmissions from light-duty to main battle tank applications. These test cells also have capability for high temperature operation up to 150 degrees Fahrenheit.

Air Flow/Coolant System Component Evaluation Laboratory

This facility can accommodate the evaluation of radiators, fans, air filters, coolant systems and air filtration systems. It includes a flow bench that can simulate a variety of real world conditions for evaluating coolant and air filtration system and component-level performance. Such measurements include precise heat rejection, restriction, filtration and efficiency parameters.

Single-cylinder Engine Research Test Cell and Laboratory

A state-of-the-art, high-output, single-cylinder diesel engine has been modified with a flexible prototype injection system and an associated flexible engine controller. Measurements include low-speed and high-speed parameters that evaluate both overall engine performance and in-cylinder combustion behavior. Facility also includes limited emission measurement capability.

Electric Components Evaluation Laboratory

This in-house facility includes dynamometer test capabilities to evaluate motors, generators and their power conditioning controllers up to 100 kilowatts. The capability to bench test equipment to evaluate electrical power converters and power devices (inverters, rectifiers, dc-dc converters) is available as well. The test cell also includes an ABC 150 and an environmental chamber to characterize new and advanced batteries.

Power and Energy System Integration Laboratory (P&E SIL)

The Power and Energy Program develops enabling technologies for combat hybrid electric vehicles. Measurements in the Power and Energy System Integration Laboratory (SIL) provide for the rapid and cost-effective validation and transition of advanced electrical technology to a vehicle, and a cost-effective means to develop and evaluate the effectiveness of combat vehicle architectures. This supports Future Combat Systems (FCS), Electrothermal Chemical Gun and Electromagnetic Armor activities.

Engine Generator Test Laboratory

The Engine Generator Test Laboratory is a test cell equipped to accommodate Future Combat Systems (FCS) Manned Ground Vehicle (MGV) size engine/generator testing. Testing capabilities include power pack characterization, mapping of power pack power and efficiency, verification of heat rejections and thermal time constants, verification of power pack response time with resistive load and acquisition of acoustic data and exhaust component performance data.

Duty Cycle Experimentation and Development

Process for development of standard mission duty cycles through simulation using the TARDEC Ride Motion Simulator (RMS)) in conjunction with the P&E SIL (see above) and TRADOC developed scenarios. Crew stations mounted on the RMS provide a driver and gunner to the simulated vehicle. The power consumption associated with mobility, lethality, survivability, turret/gun activity and battle command is recorded to represent a vehicle platform duty cycle.

Mission Voltage Component Integration Laboratory

This in-house laboratory provides ability to test and evaluate 14Vdc to 42Vdc electrical power generation, energy storage, power distribution and power management components.

Track Pad Blowout Test

Tests heat build up as it relates to hysteresis of elastomers. This test is a direct indicator as to how well a track pad compound will perform in the field. Machine capacity 5,800 pounds in compressive and tensional loading, runs at 1,800 Cycles per minute. The test bed is six square feet. The manufacturer is Baldwin.

Torsion Bar Test

Test platform for testing cycle times of torsion bars. The rotatory actuator is capable of testing Abrams torsion bars. Can provide 180 degrees of rotation. This is a hydraulically actuated system. Rotational torque can be varied to needs of specific test items.

Six Degrees of Freedom Machine

Provides a rotational motion, twist and tensional loading to simulate instantaneous dynamic loads statically in the laboratory. Machine is used to validate designs before going into vehicle test stage.

Track Pin Deflection Machine

Test deflection of metal bars until fatigue failure. This machine can apply a dynamic and static load from 0 to 5,800 pounds. Machine runs at 1,800 cycles per minute. The number of cycles until failure is counted then compared to a standard to determine a pass/fail. Is used for track system/component qualification. Test bed is 6 square feet. Manufacturer is Baldwin.

Track Bushing Research

Endurance Simulation Machines to conduct experiments on new bushing designs, compounds, thermal management, and pin-bushing-shoe interaction to increase track bushing life. The bushing laboratory consists of three T130 simulation machines, two modular bushing machines, and a complete hydraulic bushing machine. The T130 bushing machines allow new compounds and formulations to be evaluated along with conducting qualification tests under MIL-PRF-11891. The hydraulic bushing machine allows complete pitches of T158/T157/T154/T107 to be tested.

Band Track Joint Test Machine

The Band Track Joint Test Machine (JTM) is a unique piece of hardware designed to test segmented band track joints as well as small sections of segmented band track. The JTM can simulate the wrap around angles of the track moving through the drive sprocket and idler as well as a back bend scenario, reproducing the track running over a large object on the ground, i.e. a rock. The JTM also has the capability to put the test specimens through a slurry bath to simulate harsh environments.

Track Wear Research

Center Guide Wear Simulation Machine conducts experiments on Novel Lightweight Wear Resistant Materials. The center guide wear laboratory consists of a variable controlled center guide wear instrument. Center guide loads for all tracked vehicles up to the M1 can be applied to the wear specimens at speeds from 5-40 mph.

Road wheel Vertical Displacement Measurement Test Machine

This machine measures the vertical displacement of a road wheel as it moves over a tensioned track section. This information is used to develop a road wheel acceleration curve. Combining this acceleration curve with the transfer function from previous testing allows prediction and evaluation of the vibration response of future track designs prior to conducting vibration testing on a vehicle.

Universal Testing Machine, Riehle Model LS-300

Electrical mechanical tension/compressive machine. Max loading 300,000 pounds. Clearance - Vertical 49 inches, Horizontal 48x42 inches. Tests ultimate strength of components and validates finite element analysis.

Intelligent Systems Integration Lab

Two advanced technology crew stations are implemented in a SIL facilitating Soldier-machine interface, embedded simulation, and intelligent agent and behavioral software technology development and integration, as well as operator training. Identical, ruggedized crew stations are also mounted in a tracked vehicle chassis allowing field experimentation and demonstration.

Robotics System Integration Lab and Vehicle Bay

This facility allows unmanned system component technologies to be developed and matured in a laboratory setting. They can then be integrated into a variety of testbed chassis in the vehicle bay for functional testing or in preparation for field experiments.

TARDEC Robotics Mobility Lab (TRML)

Includes: (1) Indoor mobility testing high bay area used for a variety of exercises and experiments with small mobile robots. (2) A Systems Integration Laboratory (SIL) for reconfiguring and troubleshooting various robotic systems and sensor payloads, adjacent to the high bay area. (3) Modeling & Simulation Laboratory which includes various workstations along with a direct fiber optic link to a multiple processor SGI Supercomputer as well as multiple ports to the DREN network. Also included is a wireless network for direct porting of packet data to mobile robots in real time. (4) Behavioral Robotics research and test area with associated hardware/software to design and analyze advanced behavioral control schemes.

Intelligent Mobility/Robotics Laboratory

Facility consists of four major laboratories: (1) Indoor mobility testing bay; (2) Systems Integration Laboratory; (3) Modeling/Simulation Laboratory which consists of various high-end workstations along with a direct fiber link to a multiple processor SGI Supercomputer. This lab is directly supporting Omni-Directional Inspection System acquisition using RAVENS concept; (4) Behavioral/Evolutional Robotics Laboratory with associated hardware/software to design and analyze advanced behavioral control schemes.

M1A2 System Integration Laboratory

Current facility houses the M1A2 System Integration Lab that is an operational hot bench of the M1A2 electronics architecture. It provides the capability to develop, maintain, test and assess all embedded software in the M1A2 tank.

Water Quality and Water Test Cell Laboratories

Used for the testing of various water filter elements, water filter systems and providing chemical analytical support to water purification engineer functions.

Fuel Equipment Test Laboratory

Used for testing and evaluating fuel pumps, fuel filter elements, fuel filter separators, fuel nozzles and engine fuel filter elements.

Grease and Fluid Laboratory

Performs development, evaluation and environmental compliance assessments of hydraulic fluids, semisolid lubricants, solid lubricants, antifreeze and solvents to enable introduction of new technologies and development of new performance standards.

Fuels and Powertrain Lubricants Laboratory

Performs development, evaluation, qualification and environmental compliance assessments of fuels, alternative fuels and powertrain lubricants (i.e., engine oils, gear lubricants and transmission fluids) to enable introduction of new technologies and development of new performance standards.

Fuels and Lubricants Research Facility and Laboratory

This Government-owned, contractor-operated facility at the Southwest Research Institute (SWRI) in Texas, is a one-of-a-kind resource where integrated fuels-lubricants-engine systems research and development programs involving combustion, performance characterization, engine cleanliness, vulnerability assessments and tribology can be performed.

Test Sites

Active Protection configured test site at New Mexico Tech, Energetic Materials Research Technical Center.

Signature Management Virtual Design and Fabrication Laboratories

In-house virtual design and computer modeling capabilities for thermal, radar, acoustic and visual signature prediction and analysis. Computer analysis, laboratory and fabrication facilities of over 13,000 square feet dedicated to classified signature management programs and activities. This includes secure computer networks, data analysis and fabrication equipment, welders and laboratory test equipment.

Signature Management Field Testing Equipment

Thermal test trailer with calibrated imagers and 64 foot telescoping tower capability. Acoustic test trailer and towers for full hemisphere acoustic data collection. Two observer test trailers with automated computer scoring system. Visual test equipment including high-resolution cameras, spectral photometers and other equipment. Multiple operation, support, maintenance and storage trailers with power generators and other required field testing assets.

Visual Perception Laboratory (VPL)

This laboratory and its personnel provide support services for the development and testing of remote sensing systems and sensor fusion systems for a wide-variety of applications. The visual perception laboratory has three high-resolution BARCO graphics projectors and a 180-degree wrap-around screen for calibrated photosimulation of vehicles and other test targets. Digital imagery from the field is displayed. A state-of-the art 3-D display is used for signature evaluation, 3-D X-ray imaging of packages, sensor fusion for vehicle-based situational awareness vision systems and IED/mine detection.

Laser Protection Materials Development Laboratory

This facility is equipped with state-of-the-art Q-switched pulsed lasers, detectors, cameras for energy and beam-shape monitoring, and a fast oscilloscope all integrated in computer-controlled test apparatus providing the capability to test and analyze materials for protection from laser weapons. The wavelength bandwidth investigated in this laboratory is 400-930 nm (no mid or far infrared capability).

Frequency Doubler and Tripler

Laser Protection Materials Development Laboratory: Single Mode Nd:YAG Laser With This laser is both spatially and modally single mode with an output energy per pulse of 250 millijoules at 1064 nanometer wavelength. The extremely good quality of the output beam at such high energies makes this laser uniquely qualified for scientific study of laser-material interactions.

Design and Digital Mock-up Laboratory

Provides timely, cost-effective design, engineering and digital mock-up support using today's state-of-the art Modeling and Simulation tools that are integrated together to create a 3-D, interactive, realistic, real-time computer-generated environment that provides direct input to user's senses via visualization tools including head-mounted and head-coupled displays and the Cave Automatic Virtual Environment (CAVE). The computer aided modeling and simulation capability provides an excellent display of the design in dynamic mode for tolerance, allowance and assembly analysis.

Electronics and Prototyping Laboratory

Lab is used to build circuit boards, prototype Fused Deposition Models, and fabricate with the LASER cutter. Special Ventilation is needed to meet OSHA air quality requirements. Layout allows us to rapidly fabricate and field circuit boards and CAD drawings into physical models.

Physical Prototyping Laboratory

Provides timely, cost-effective translation of virtual designs into hardware using state-of-the art tools to simulate and optimize manufacturing processes, and machining, metal working, welding and assembly capabilities to produce sub- and full- system level functional prototypes. This is a 50-foot high bay area with 16 foot reinforced concrete floors and recessed machine foundations. It houses one 50 and four 10 ton cranes directly integrated into the building along with a complete coatings facility. This provides the capability to develop and prototype advanced ground combat vehicle systems up through 70 tons. This also allows the engineer and scientists along with the PMs to have access to multi systems thus simultaneously improving the vehicle systems resulting in a synergistic enhancement of mission capabilities.

U.S. Army TARDEC Laboratory University Partnerships

In addition to the TARDEC Laboratory, these facilities - The University of Michigan, Clemson University, Oakland University, University of Alaska-Fairbanks, University of Iowa, University of Tennessee, University of Wisconsin-Madison, and Wayne State University - are the eight major university-based laboratories conducting research in Intelligent Vehicle Dynamics and Control, Human Centered Modeling and Simulation, High Performance Structures and Materials, Advanced and Hybrid Powertrains, and Integrated System Design and Simulation. Automotive Research Center (ARC) activities support vehicle design objectives of versatility, high mobility, modularity and low cost. Increased emphasis is for research involving high mileage, low-polluting vehicles, particularly those employing hybrid powertrains. High technology needs for large trucks and off-road vehicles are emphasized.

Cave Automatic Virtual Environment (CAVE)/ Immersive Virtual Environment (IVE) Laboratory

The CAVE is a multi-person, 10x10, high-resolution 3-D-video/audio environment. The system uses four rear projected screenwalls, a front projected floor, Christie Mirage 4000 projectors, Mylar mirrors, infrared emitters, Liquid Crystal Display stereoscopic shutter glasses, Innersense position sensing system, and a SGI Onyx2 computer which creates 1280X1024 resolution stereo images. TARDEC also has a CAVE at Altair in a collaborative lab space, a CAVE at Fort Knox, and a portable RAVE (Reconfigurable CAVE) that can be taken to other facilities.

Powerwall/Immersive Virtual Environment (IVE) Laboratory

The PowerWall facility is located in the National Automotive Center (NAC). It is a seven x 15-foot rear-projected glass screen, with state-of-the-art Barco DLP projectors, surround sound audio, and video teleconferencing integrated with other NAC/TARDEC locations. It displays life-size flat and stereoscopic images. It is powered by TARDEC's High Performance Computing systems as well as other computational platforms and audio/video resources. A prominent PowerWall feature is its ability to simultaneously display multiple images from multiple sources/locations.

Ride Motion Simulator (RMS)/Ground Vehicle Simulation Laboratory

The ride motion simulator is a six degrees of freedom motion simulator designed for crew station and soldier-in-the-loop experimentation. It is capable of reproducing the ride of automotive, combat, tactical and nearly any ground vehicle with high precision. It has integrated motion, audio, and visual systems for high fidelity simulations.

Crew Station/Turret Motion Base Simulator (CS/ TMBS)/Ground Vehicle Simulation Laboratory

The CrewStation/Turret Motion Base Simulator (CS/TMBS) is a high-capacity six degrees of freedom test device. This system is capable of reproducing dynamic conditions encountered by combat vehicle crew station and turret systems traversing secondary roads and cross country terrain. The system offers remarkable repeatability and control over variables difficult to manage in the field.

Ground Vehicle Simulation Lab (GVSL) Synthetic Environment

The synthetic environment provides for the immersion of the soldier and his vehicle into the virtual environment. Subsystems include full six degrees of freedom motion, visuals, and audio. A number of multi-body vehicle dynamics models, terrain and visual databases comprise the capability. Real-time software allows rapid communications and dataflow to all the subsystems.

Pintle Motion Base Simulator (PMBS)/Ground Vehicle Simulation Laboratory

The Pintle Motion Base Simulator (PMBS) is a hydraulically powered physical motion-base simulator. It is designed to test light to medium weight lunette trailers. It can impart motion to the lunette of a trailer (hitch) in three directions (vertical, lateral, and longitudinal). In addition to this, it also has the ability to move each wheel of a trailer in the vertical direction. It was designed to test trailers with a gross vehicle weight (GVW) of up to 9,000 kg (20,000 pounds).

Reconfigurable N-Post Simulator/Ground Vehicle Simulation Laboratory

The re-configurable motion base simulators feature vertical tire and track-coupled fixtures that are generally used for chassis and body/ payload fatigue studies. These fixtures are easy to set up and can accommodate vehicle GVW's up to 20 tons. Computer and servo-controlled hydraulic actuators provide the forcing function into the test specimen. The actuator duty cycle can originate from proving ground, computer-based, or swept sine sources.

Vehicle Inertia Properties Evaluation Rig (VIPER)/ Ground Vehicle Simulation Laboratory

The VIPER is used to accurately measure system and subsystem inertial characteristics of trucks, trailers, and turrets. Most vehicles can be evaluated without modification or disassembly. The VIPER consists of four in-ground scales, a configurable platform and the software necessary to post-process the results.

Computer Based Applications/Ground Vehicle Simulation Laboratory

The GVSL Software suite of tools includes the Dynamic Analysis and Design System (DADS), Abaqus, Maya, MSC Fatigue, and Patran commercial products as well as a variety of in-house developed tools. Typical system performance measures quantified are ride quality, handling, component structure and fatigue life analysis.

TARDEC High Performance Computing (HPC) Center

HPC systems include: 24-processor Silicon Graphics, Inc. (SGI) Onyx 3900, 32-processor SGI Onyx 350, 12-processor SGI Onyx 4, and eight processor SGI Altix 3300 augmented with substantial storage (on-line and off-line) and HPC-specific high speed, high bandwidth fiberoptic networking for HPC-based computation and visualization throughout TARDEC's Warren campus. The TARDEC HPC Center was established and designated as a DoD HPC Distributed Center from 1996 - 2002 and is still prominent, with national positive visibility and regard, in the Army and DoD HPC communities

Reconfigurable Automatic Virtual Environment (RAVE)/Immersive Virtual Environment (IVE) Laboratory

The RAVE is a transportable multi-person, 8x10 foot, high-resolution 3-D-video/audio environment. The system has three rear-projected screens, a front-projected floor, Christie Digital Mirage 2000 DLP projectors, infrared emitters, Liquid Crystal Display stereoscopic shutter glasses, and an electro-magnetic tracking system. The RAVE can be setup in various configurations, including a traditional CAVE setup and a 'COVE' setup with one wall opened to allow more people to view the images being displayed.

Advanced Collaborative Environments (ACE) Laboratory/Immersive Virtual Environment (IVE) Laboratory

The ACE Laboratory contains a 'five-walled' CAVE system with a pneumatic rear wall that closes behind the user to allow further immersion in a vehicle system within the virtual world. The system has four rear-projected screens, a front-projected floor, Christie Digital Mirage 4000 DLP projectors, infrared emitters, Liquid Crystal Display stereoscopic shutter glasses, and a wireless inertial/ultrasonic tracking system. The laboratory also contains an interactive conference room with a touch screen display, and a computer station area for the use and display of ACE tools.

Advanced Concepts Laboratory

This interactive collaboration facility is equipped for design and analysis of 3-D solid model vehicle concepts, up to and including Secret, Special Access Programs (SAP), and Top Secret level designs. Animation and stereo imaging tools are available, providing the capability for interactive concept design reviews in the Visualization Center. In addition, the laboratory's Collaboration Center and Control Room are networked for Web-based or DTV collaborative efforts with over 30 LAN-ready laptops available for interactive group participation. With audio and video interconnectivity between all three areas, the Visualization Center and Control Room can supplement the 30 person capacity of the Collaboration Center, with an additional capacity of 10 seats each. This additional capacity can be used for overflow or breakout sessions.

Fuels and Lubricants Vehicle Filter Test Equipment

This test equipment is capable of evaluating vehicles' fuel and lubricant filters using the latest ISO test procedures. The equipment allows evaluation of expected life, efficiency and other parameters needed to establish filter performance for vehicles.

Petroleum and Water Business Area (PWBA) Water Treatment Test Facility (Selfridge Air National Guard Base Bldg 350)

PWBA Water Treatment Test Facility (SANG B350) located on Lake St. Clair has the capability of operating pilot-scale to full-scale sized water treatment systems and components. The facility houses several 600 Gallons Per Hour (GPH) Reverse Osmosis Water Purification Units (ROWPUs) and 3,000 GPH ROWPUs. These units can be used as test beds for evaluating the performance of commercially available and experimental components for their usefulness on military water treatment equipment. The facility can also be used to train water treatment system operators to use military and commercial water treament systems.

Dynamic Structural Load Simulator Laboratory (DSLSL)

This facility is equipped with an overhead gantry, ten hydraulic load actuators on five moveable transoms, tool crib, parts crib, fabrication area and office space. The hydraulic actuators can be used to conduct full-scale structural testing of components or complete structures. The hydraulic actuators are computer driven by design test loads or actual vehicle crossing profiles. The hydraulic actuators can be configured to accommodate any size of military bridge. The facility can also be used to conduct other analysis and equipment evaluation to meet the needs for fielded equipment sustainment and the needs of the future Army. Successful static testing has been conducted on the Wolverine supporting the full material release. Technology evaluation of the Composite Army Bridge has been conducted in the facility.

Light-Weight Materials Test, Analysis, and Prototype Fabrication Center

Provides concurrent fabrication, assessment and evaluation of advanced materials and fabrication processes. It includes mechanical testing, metallurgical testing, nondestructive analysis of production and advanced materials/components at various temperatures, and prototype fabrication of advanced materials/components. Center had environmentally controlled, unique fixturing, high load capacity, unique Instron load frame, in a sensitive environment for special projects. There is a Composite Lay Up Area / Non Destructive Inspection Area / Instron and Dynatup Control Room / Metallurgical Laboratory.

Mobil Parts Hospital

This facility develops mobile military replacement parts prototyping and fabrication technology for field replacements. This provides a means of maintaining system capability and operational readiness while waiting for the logistics tail to catch up. Mobile parts manufacturing includes reverse engineering and efficient parts fabrication, machining and evaluation for immediate field repair.

Countermine Testing Complex Facility

The Countermine Testing Complex is a dedicated area at Aberdeen Proving Grounds. This one-of-a-kind facility gives us a drive-through capability to establish a mechanical countermine system's capability to reliably clear a minefield seeded with pressure fuzed, tilt-rod actuated, and exotic (seismic, magnetic influence, acoustic) mines. The facility includes mine lanes, a magnetic countermine test area, a static blast test area, shop and equipment storage facilities, and fully functional office space to support testing. Currently, there are plans to add Route Clearance and IED detection/neutralization testing capability in the near future.

Surrogate Instrumented Mine Capability

Surrogate Instrumented Mine (SIM) system is a system of unique CM instruments and software developed to evaluate mine neutralization effectiveness and strong potential to utilize for conducting antitank mine vehicular overpass analysis in a dynamic environment. Previously, this type of testing required Explosive Ordinance Disposal (EOD) personnel to place small explosive charges for detonation by vehicle overpass. This type of testing is expensive and tests need to be scheduled months in advance. The SIM uses sensors instead of explosives to give mine pressure plate readings rather than detonated/not detonated type data. It can generally be used in any open area in a variety of soil conditions.

Battery Technology Evaluation Laboratory

Construction started on in-house testing lab facility for evaluation of advanced batteries (Li-Ion, NiMH, NiZn) and hybrid DC-DC converter/battery systems. Lab equipment procured are two programmable battery cycling systems, an environmental chamber for battery testing, a fume hood and an electrochemical Impedance spectrometer for "equivalent circuit" battery characterization.

Pervasive Computing (PvC) Laboratory

The PvC Laboratory is located in the National Automotive Center (NAC) High Performance Computing Center. PvC involves connecting and sharing information between many distributed, but interconnected, devices. These devices can be vehicles, appliances, servers, and sensors. Effort is to explore, expand, and transition commercial PvC technology into the military. The PvC Laboratory designs and develops new applications, integrates/adapts existing applications, and consults with other organizations to implement PvC best practices.

Embedded Simulation (ES) Laboratory

This lab supports local and long-haul distributed simulation in both a classified and non-classified environment. There is a Distributed Virtual Lab (DVL) connection to the other RDECs that make up the MATREX federation.

TARDEC Distributed Virtual Lab (DVL)

This lab supports local and long-haul distributed simulation in both a classified and non-classified environment. The DVL connects to the other RDECs making up the MATREX federation.

Capabilities at a Glance

Environmental Heat Management Chamber and Laboratory

Steady-State Vehicle Evaluation Test Cell and Laboratory

Flexible Steady-State/Transient Vehicle Evaluation Test Cell and Laboratory

Propulsion System Component Test Cells and Laboratories

Air Flow/Coolant System Component Evaluation Laboratory

Single-cylinder Engine Research Test Cell and Laboratory

Electric Components Evaluation Laboratory

Power and Energy System Integration Laboratory (P&E SIL)

Engine Generator Test Laboratory

Duty Cycle Experimentation and Development

Mission Voltage Component Integration Laboratory

Track Pad Blowout Test

Torsion Bar Test

Track Pin Deflection Machine

Track Bushing Research

Band Track Joint Test Machine

Track Wear Research

Road wheel Vertical Displacement Measurement Test Machine

Universal Testing Machine, Riehle Model LS-300

Intelligent Systems Integration Lab

Robotics System Integration Lab and Vehicle Bay

TARDEC Robotics Mobility Laboratory

M1A2 System Integration Laboratory

Water Quality and Water Test Cell Laboratories

Fuel Equipment Test Laboratory

Grease and Fluid Laboratory

Fuels and Powertrain Lubricants Laboratory

Fuels and Lubricants Research Facility and Laboratory

Test Sites

Signature Management Virtual Design and Fabrication Laboratories

Signature Management Field Testing Equipment

Visual Perception Laboratory (VPL)

Laser Protection Materials Development Laboratory

Design and Digital Mock-up Laboratory

Electronics and Prototyping Laboratory

Physical Prototyping Laboratory

U.S. Army TARDEC Laboratory University Partnerships

Cave Automatic Virtual Environment (CAVE)/Immersive Virtual Environment (IVE) Laboratory

Powerwall/Immersive Virtual Environment (IVE) Laboratory

Ride Motion Simulator (RMS)/Ground Vehicle Simulation Laboratory

Crew Station/Turret Motion Base Simulator (CS/TMBS)/Ground Vehicle Simulation Laboratory

Ground Vehicle Simulation Lab (GVSL) Synthetic Environment

Pintle Motion Base Simulator (PMBS)/Ground Vehicle Simulation Laboratory

Reconfigurable N-Post Simulator/Ground Vehicle Simulation Laboratory

Vehicle Inertia Properties Evaluation Rig (VIPER)/Ground Vehicle Simulation Laboratory

Computer-Based Applications/Ground Vehicle Simulation Laboratory

TARDEC High Performance Computing (HPC) Center

Reconfigurable Automatic Virtual Environment (RAVE)/Immersive Virtual Environment (IVE) Laboratory

Advanced Collaborative Environments (ACE) Laboratory/Immersive Virtual Environment (IVE) Laboratory

Advanced Concepts Laboratory

Fuels and Lubricants Vehicle Filter Test Equipment

Petroleum and Water Business Area (PWBA) Water Treatment Test Facility (Selfridge Air National Guard Base Bldg 350)

Dynamic Structural Load Simulator Laboratory (DSLSL)

Light Weight Materials Test, Analysis, and Prototype Fabrication Center

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Surrogate Instrumented Mine Capability

Battery Technology Evaluation Laboratory

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TARDEC Distributed Virtual Laboratory

Partnerships

The University of Michigan

Clemson University

Oakland University

University of Alaska-Fairbanks

University of Iowa

University of Tennessee

University of Wisconsin-Madison

Wayne State Universit

Index

Numbers

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

V

W

X


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